Contents

Frontispiece—Jean D. Wilson	xiv
Perspectives, Joseph F. Hoffman, Editor	
A Double Life: Academic Physician and Androgen Physiologist, Jean D. Wilson	1
CARDIOVASCULAR PHYSIOLOGY, Jeffrey Robbins, Section Editor	
Lipid Receptors in Cardiovascular Development, Nick Osborne and Didier Y.R. Stainier	23
Cardiac Hypertrophy: The Good, the Bad, and the Ugly, N. Frey and E.N. Olson	45
Stress-Activated Cytokines and the Heart: From Adaptation to Maladaptation, Douglas L. Mann	81
CELL PHYSIOLOGY, Paul De Weer, Section Editor	
Cell Biology of Acid Secretion by the Parietal Cell, Xuebiao Yao and John G. Forte	103
Permeation and Selectivity in Calcium Channels, William A. Sather and Edwin W. McCleskey	133
Processive and Nonprocessive Models of Kinesin Movement, Sharyn A. Endow and Douglas S. Barker	161
COMPARATIVE PHYSIOLOGY, George N. Somero, Section Editor	
Origin and Consequences of Mitochondrial Variation in Vertebrate Muscle, Christopher D. Moyes and David A. Hood	177
Functional Genomics and the Comparative Physiology of Hypoxia, Frank L. Powell	203
Application of Microarray Technology in Environmental and Comparative Physiology, Andrew Y. Gracey and Andrew R. Cossins	231
_	231
ENDOCRINOLOGY, Bert W. O'Malley, Section Editor	
Nuclear Receptors and the Control of Metabolism, Gordon A. Francis, Elisabeth Fayard, Frédéric Picard, and	
Johan Auwerx	261
	11

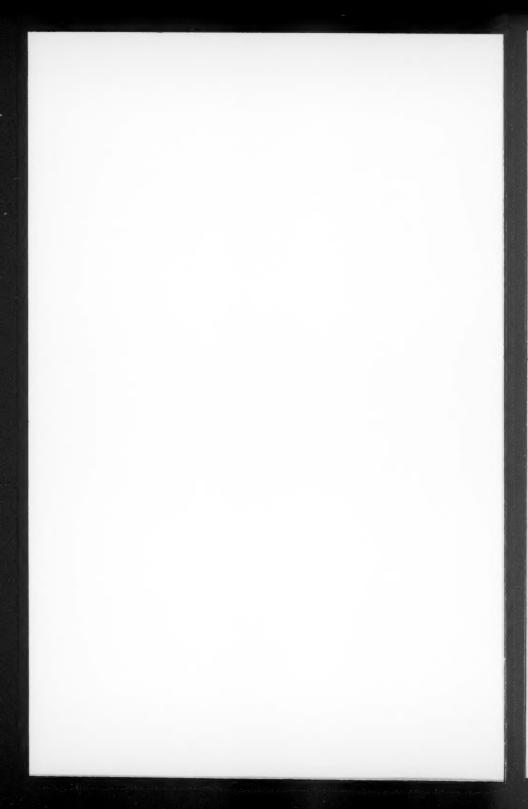
Insulin Receptor Knockout Mice, Tadahiro Kitamura, C. Ronald Kahn, and Domenico Accili	313
The Physiology of Cellular Liporegulation, Roger H. Unger	333
GASTROINTESTINAL PHYSIOLOGY, John Williams, Section Editor	
The Gastric Biology of Helicobacter pylori, George Sachs, David L. Weeks, Klaus Melchers, and David R. Scott	349
Physiology of Gastric Enterochromaffin-Like Cells, Christian Prinz, Robert Zanner, and Manfred Gratzl	371
Insights into the Regulation of Gastric Acid Secretion Through Analysis of Genetically Engineered Mice, Linda C. Samuelson and Karen L. Hinkle	383
NEUROPHYSIOLOGY, Richard Aldrich, Section Editor	
In Vivo NMR Studies of the Glutamate Neurotransmitter Flux and Neuroenergetics: Implications for Brain Function, Douglas L. Rothman, Kevin L. Behar, Fahmeed Hyder, and Robert G. Shulman	401
Transducing Touch in Caenorhabditis elegans, Miriam B. Goodman and Erich M. Schwarz	429
Hyperpolarization-Activated Cation Currents: From Molecules to Physiological Function, <i>Richard B. Robinson and Steven A. Siegelbaum</i>	453
RENAL AND ELECTROLYTE PHYSIOLOGY, Steven C. Hebert, Section Editor	
Macula Densa Cell Signaling, P. Darwin Bell, Jean Yves Lapointe, and János Peti-Peterdi	481
Paracrine Factors in Tubuloglomerular Feedback: Adenosine, ATP, and Nitric Oxide, Jürgen Schnermann and David Z. Levine	50
Regulation of Na/Pi Transporter in the Proximal Tubule, Heini Murer, Nati Hernando, Ian Forster, and Jürg Biber	531
Mammalian Urea Transporters, Jeff M. Sands	543
Terminal Differentiation of Intercalated Cells: The Role of Hensin, Qais Al-Awqati	56
RESPIRATORY PHYSIOLOGY, Carole R. Mendelson, Section Editor	
Current Status of Gene Therapy for Inherited Lung Diseases, Ryan R. Driskell and John F. Engelhardt	58:
The Role of Exogenous Surfactant in the Treatment of Acute Lung Injury, James F. Lewis and Ruud Veldhuizen	61:
Second Messenger Pathways in Pulmonary Host Defense, Martha M. Monick and Gary W. Hunninghake	643

CONTENTS

ix

ERRATA

An online log of corrections to *Annual Review of Physiology* chapters may be found at http://physiol.annualreviews.org/errata.shtml



SUBJECT INDEX

A	gastric mucosal	signal transduction
AAVS1 gene	hypertrophy, 390-91	underlying gastric acid
lung gene therapy and, 590	gastrin, 394-95	secretion, 106-12
Acclimation	gastrin pathway, 387-88,	SNARE proteins,
microarray technology and,	390	113–14
231-51	histamine pathway,	structural basis, 104-6
Acetylcholine	388-90	TGFα, 111–12
acid secretion by parietal	introduction, 383-87	trafficking, 112-18
cell and, 103-23	loss-of-function, 387-88	Acquired lipodystrophy
gastric acid secretion in	overexpression, 388	liporegulation and, 333
genetically engineered	parietal cells, 391-94	Acrp30 protein
mice and, 383-96	somatostatin pathway,	liporegulation and, 338
Acetyl CoA carboxylase	391	α-Actinin
(ACC)	transgenes, 393-95	phosphoinositide
liporegulation and, 335-37	parietal cells and, 371-77	regulation of actin
Acheta domestica	actin, 118-22	cytoskeleton and, 775-76
transducing touch in	actin-based	Actins
Caenorhabditis elegans	cytoskeleton, 118-22	acid secretion by parietal
and, 433	activation, 109-11	cell and, 118-22
Acidosis	adaptor proteins, 115	hensin and terminal
hensin and terminal	cAMP, 106-9	differentiation, 569, 574
differentiation, 567-80	cholinergic pathways,	lung gene therapy and, 596
Acid resistance/tolerance	109-11	phosphoinositide
gastric biology of	clathrin coat proteins,	regulation of actin
Helicobacter pylori and,	115	cytoskeleton and, 761-80
349-50, 353-64	duodenal peptides, 112	Activation
Acid secretion	dynamin, 116	acid secretion by parietal
gastric	EGF, 111-12	cell and, 103-23
enterochromaffin-like	ezrin, 120-22	G protein-coupled receptor
cells and, 371-77	fusion reaction, 122	rhodopsin and, 867-69
genetically engineered	H,K-ATPase, 112-18	hensin and terminal
mice and	introduction, 103-4	differentiation, 579
acetylcholine pathway, 390–91	miscellaneous cellular proteins, 121–22	hyperpolarization-activated cation currents and,
ADA promoter, 395	myosin Vb, 116–17	453–72
chromogranin A	neural peptides, 112	
promoter, 394	perspectives, 123	lung gene therapy and, 599 NMR of glutamate
conclusions, 395–96	PKA, 106–9	neurotransmitter flux and
ECL cells, 394	protein phosphorylation, 106–9	neuroenergetics, 410–11
forestomach, 395		phosphoinositide regulation of actin
G cells, 394, 395	Rab proteins, 114–15	regulation of actin

cytoskeleton and, 767–68, 772 stress-activated cytokines

and the heart, 81-95

TRP channel regulation via lipid second messengers and, 749–50

Active cation transport proteins

Na,K-ATPase structure and mechanism, 817–41

Active urea transport mammalian urea transporters and, 543, 555–56

Acute acid resistance gastric biology of Helicobacter pylori and, 354-63

Acute respiratory distress syndrome (ARDS) acute lung injury (ALI) and surfactant therapy for, 613–32

Acyl-CoA synthetase nuclear receptors in metabolism and, 269, 274

A-cytoplasmic domains Na,K-ATPase structure and mechanism, 817–41

Adaptive immunity second messenger pathways in pulmonary host defense and, 657

Adaptive remodeling mitochondrial variation in vertebrate muscle and, 177, 187–89

Adaptive response stress-activated cytokines and the heart, 81, 83–88 functional genomics and comparative physiology of hypoxia, 203–24 microarray technology and, 231–51 nuclear receptors in

metabolism and, 261 Adaptor proteins

acid secretion by parietal cell and, 115

ADE ciliated sensory neurons transducing touch in Caenorhabditis elegans and, 435

Adeno-associated virus (AAV)

lung gene therapy and, 585, 590–92, 596–604

Adenosine

macula densa cell signaling and, 493–95

paracrine factors in tubuloglomerular response and, 501–14

Adenosine 1 receptors (A1AR)

paracrine factors in tubuloglomerular response and, 501, 505–6

Adenosine deaminase (ADA) promoter

gastric acid secretion in genetically engineered mice and, 395

Adenosine triphosphate (ATP) gastric biology of

Helicobacter pylori and, 354–55

macula densa cell signaling and, 493–95

mitochondrial variation in vertebrate muscle and, 177-93

Na,K-ATPase structure and mechanism, 817, 821–22, 835–36, 838–39

paracrine factors in tubuloglomerular response and, 501, 508–14 processive and nonprocessive models of kinesin movement, 161–72

Adenovirus

recombinant

lung gene therapy and, 585, 588–90, 597

Adenylyl cyclase gastric

enterochromaffin-like cells and, 371–77

Adipose tissue

insulin receptor knockout mice and, 313–25 liporegulation and, 333–44

nuclear receptors in metabolism and, 261, 269–73

A domain

Na,K-ATPase structure and mechanism, 824, 832–38

Adrenalectomy

liporegulation and, 343 mammalian urea transporters and, 551–52

Adriamycin mammalian urea transporters and, 552

transporters and, 552 AE1 protein hensin and terminal

differentiation, 569–71, 576–77
Afferent arterioles

paracrine factors in tubuloglomerular response and, 502–4, 508–9

Affinity modulation calcium channel permeation and selectivity, 134–36

hensin and terminal differentiation, 579

age1 mutant insulin receptor knockout mice and, 325

Airway epithelium

Aminophospholipid

lung gene therapy and. immunomodulation. insect phagocyte receptors, 585-604 682-83 713-18 akt genes intact animals, 676-77 integrins, 714 cardiac hypertrophy and, introduction, 669-70 introduction, 702 49-51 in vitro type I cell models, macrophage receptors, insulin receptor knockout 687 711 - 13mice and, 325 in vivo promoter mammalian receptors, Albumin specificity, 673-74 713 - 18surfactant therapy for ion transporters, 683-84 membrane lipid ALI/ARDS and, 618 lung, 680, 686-87 assymmetry, 706-11 Aldosterone methylation, 673 Mer. 713 mammalian urea non-lung precursor cells, Mg²⁺-ATPase, 704-5 transporters and, 552 687-88 multidrug resistance ALEC surfactant peptidolytic enzyme, proteins, 705-6 surfactant therapy for 681-82 outer membrane leaflet, ALI/ARDS and, 620, primary cells, 674 625-26 proteins, 683-84 phagocytosis of aberrant Altruism receptors, 683-84 cells, 711-13 gastric biology of regulation, 672-74, PS receptor, 718 Helicobacter pylori and, 676-77, 679-80 PSOX, 717, 718 356 signaling, 678-81 receptor redundancy, Alveofact $T1\alpha$, 671–75 718 - 19surfactant therapy for transcytosis, 678-81 red blood cell senescence ALI/ARDS and, 620, water channel, 675-78 and disease, 709-10 625-26 Amiloride-sensitive channels scavenger receptor Alveolar macrophages transducing touch in superfamily second messenger Caenorhabditis elegans scavenger receptor class pathways in pulmonary and, 429, 436-42 A (SRA), 716 host defense and, Aminophospholipid scavenger receptor class 642-57 asymmetry B (SRB), 716-17 Alveolar type I epithelial cells aminophospholipid scavenger receptor class translocase, 704-5 animals, 674 C (SRCL), 717 aquaporin 5, 675-78 apoptosis, 708-9, 711-18 scavenger receptor class carboxypeptidase M, blood clotting, 707-8 D (LAMP), 717 681-82 Caenorhabditis elegans scavenger receptor class caveolin-1, 678-81 death (CED) proteins, E (SREC), 717 cell injury, 685-87 711, 713 scramblase, 706 cell types, 676-77 calreticulin, 715 trafficking of conclusions, 688 CD14, 714-15 aminophospholipids to development, 684-85 CD93, 715 plasma membrane, 702, early research, 671 cell biogenesis, 706-7 enzymes, 683-84 complement receptors, transporter identification, experimental models, 687 715 704-6 fetus, 684-85 tumor cells and tumor conclusions, 719-20 gene expression, 686-87 β 2-glycoprotein I receptor, vasculature, 710-11 human homologs, 674-75 715 - 16wound repair, 707, 708

homeostasis, 711

ICAM-1, 682-83

translocase aminophospholipid asymmetry and, 704–5 amiS genes gastric biology of Helicobacter pylori and, 349 Amoxicillin

gastric biology of Helicobacter pylori and, 349, 364–65

Amphiphysin gastric enterochromaffin-like cells and, 371, 376–77

Amplification TRP channel regulation via lipid second messengers and, 745–47

Anchoring phosphoinositides in membrane retrieval and insertion, 791–808

Androgens history of research, 1–17 Angiogenesis

lipid receptors in cardiovascular development and, 23, 26–29

Angiotensin II mammalian urea transporters and, 549, 552, 557 paracrine factors in

tubuloglomerular response and, 501, 506–7

Anguilla rostrata functional genomics and comparative physiology of hypoxia, 217

Annexin aminophospholipid asymmetry and, 710

Anser spp.
functional genomics and
comparative physiology

of hypoxia, 210 α 1-Antitrypsin deficiency lung gene therapy and, 585, 587–89

Apical K conductance macula densa cell signaling and, 485–86

Apical membrane hensin and terminal differentiation, 567–80

Apical pole remodeling acid secretion by parietal cell and, 103-23

Apical positioning type IIa Na/Pi cotransporter and, 531–36

Apolipoproteins nuclear receptors in metabolism and, 262, 274-77

Apoptosis aminophospholipid asymmetry and, 701, 703, 708–9, 711–18 liporegulation and, 333,

338, 340–44
Appetite suppression
insulin receptor knockout
mice and, 323

Aquaporins alveolar type I epithelial cells and, 675–78 hensin and terminal differentiation, 575

Arabidopsis thaliana transducing touch in Caenorhabditis elegans and, 441, 443

Arachidonic acid TRP channel regulation via lipid second messengers and, 735–52

Arf family GTPases phosphoinositide regulation of actin cytoskeleton and, 768 L-Arginine mammalian urea transporters and, 554 Arp2/3 complex phosphoinositide regulation of actin cytoskeleton and, 771–73

Arterioles afferent

paracrine factors in tubuloglomerular response and, 502–4, 508–9

Artificial selection functional genomics and comparative physiology of hypoxia, 203–24

ASC complexes transducing touch in Caenorhabditis elegans and, 436–37

asc genes transducing touch in Caenorhabditis elegans and 441–42

ASH ciliated sensory neurons transducing touch in Caenorhabditis elegans and, 434–35

Asthma surfactant therapy for ALI/ARDS and, 632

Astrocytes NMR of glutamate neurotransmitter flux and neuroenergetics, 401–20

Asymmetry aminophospholipid, 701–20 calcium channel

permeation and selectivity, 141–44 phosphoinositides in membrane retrieval and insertion, 791–97, 804–5

Atherosclerosis nuclear receptors in metabolism and, 261, 268 **ATPases** rhodopsin and, 866, 867 Blood clotting V-type **BAPTA** aminophospholipid gastric hensin and terminal asymmetry and, 707-8 enterochromaffin-like differentiation 578 Blood flow cells and, 371-77 Basolateral channel macula densa cell signaling ATP-binding cassette macula densa cell signaling and, 481-95 transporter A1 (ABCA1) and, 481-95 Body wall nuclear receptors in **BATIRKO** mice transducing touch in metabolism and, 262. insulin receptor knockout Caenorhabditis elegans 276-78 mice and, 322 and, 429-46 Attenuation Bauhinia purpurea Brachydanio rerio cardiac hypertrophy and, alveolar type I epithelial transducing touch in 65 cells and, 683, 687 Caenorhabditis elegans Automaticity **BCECF** and, 430 hyperpolarization-activated gastric biology of Brain cation currents and. Helicobacter pylori and. hyperpolarization-activated 466-69 cation currents and, Autoregulation bcl-2 gene 461-62 paracrine factors in gastric insulin receptor knockout tubuloglomerular enterochromaffin-like mice and, 313-25 response and, 501, cells and, 377 mammalian urea 509-10 liporegulation and, 341 transporters and, 558 Biased diffusion model NMR of glutamate R processive and neurotransmitter flux and Bacteria nonprocessive models of neuroenergetics, 401-20 acid secretion by parietal kinesin movement, 161. Brown adipocytes cell and, 107 170 insulin receptor knockout gastric biology of Bile acids mice and, 322 Helicobacter pylori and, nuclear receptors in Brush border membrane 349-65 metabolism and, 261. type IIa Na/Pi gastric 280-86 cotransporter and, 531-36 enterochromaffin-like Bile salt export pump (BSEP) Bumps cells and, 371, 377 nuclear receptors in quantum lung gene therapy and, 587, metabolism and, 262 TRP channel regulation Biogenesis via lipid second microarray technology and, membrane messengers and, 250 mitochondrial variation 737-38, 746-47 phosphoinositides in in vertebrate muscle membrane retrieval and and, 184-85 C insertion, 806 Birds Ca-ATPase second messenger functional genomics and Na.K-ATPase structure and pathways in pulmonary comparative physiology mechanism, 817-41 Ca2+ host defense and, 642-57 of hypoxia, 210-11

BLES surfactant

625-26

surfactant therapy for

ALI/ARDS and, 619-20,

gastric

enterochromaffin-like

cells and, 371, 373-74

macula densa cell signaling

surfactant therapy for

Bacteriorhodopsin

ALI/ARDS and, 615

G protein-coupled receptor

and, 481-95 TRP channel regulation via lipid second messengers and, 735-52 Ca2+ channels

permeation and selectivity in affinity, 134-36

amino acid residues, 137-41 EEEE locus, 145

functional assymetry, 141-44 functional groups.

144-46 glutamates, 141-44

high-affinity Ca2+ binding region, 139-41 introduction, 133-34

K+ channels, 145-46 multi-ion basis of selective permeability in Ca channels, 134-37 multi-ion pore, 136-37

non-selectivity filter domains, 146

predicted structures. 152-54 probing side chain

orientation, 145 protonation, 145 rate theory, 148-51 selective ion transport,

146-47 selective permeability, 134-47

selectivity filter, 137-46 structural

approximations. 151 - 52substituted-cysteine

accessibility, 145 summary, 154-55

theories of Ca channel permeation, 147-54

permeation and selectivity in, 133-55

Caenorhabditis elegans

aminophospholipid asymmetry and, 711, 713 functional genomics and comparative physiology

of hypoxia, 205 insulin receptor knockout mice and, 324-25

microarray technology and, 238, 242

phosphoinositides in membrane retrieval and insertion, 806

Calcineurin cardiac hypertrophy and, 46-49

Calcium channels

TRP channel regulation via lipid second messengers and, 735-52

Calliphora spp.

TRP channel regulation via lipid second messengers and, 748

Caloric intake

liporegulation and, 333-44 Calpain

acid secretion by parietal cell and, 121-22 insulin receptor knockout mice and, 324

Calpastatin acid secretion by parietal cell and, 122

Calreticulin aminophospholipid asymmetry and, 712, 715

Cancer

aminophospholipid asymmetry and, 703, 710 - 11gastric biology of Helicobacter pylori and,

350-51, 365 gastric

enterochromaffin-like cells and, 371

Capping

602

phosphoinositide regulation of actin cytoskeleton and, 774-75

CAR receptors lung gene therapy and, 588,

Carboxyl side chains calcium channel permeation and selectivity, 133-55

Carboxypeptidase M alveolar type I epithelial cells and, 681-82

Cardiac automaticity hyperpolarization-activated cation currents and. 466-68

Cardiac hypertrophy attenuation, 65 calcineurin-NFAT signaling, 46-49 CHAMP, 63, 64 compensatory response, 64-66 gp130/STAT3 signaling, 59-60

G protein-coupled receptors, 53 Gi signaling, 55 G_s signaling, 54-55 Gq/G₁₁ signaling, 53-54 inhibition, 64-66 introduction, 45-46 lipid metabolism, 60-62 maladaptation, 64-66 MAPK pathways, 57-58 MEF2/HDAC, 52-53

miscellaneous pathways, 62-64

MMP/TNF, 62-63 molecular pathways, 46-62 Na/H exchanger inhibition,

63-64 PI3K/Akt/

GSK-3-dependent signaling, 49-51

PKC, 58–59 sarcomeric signaling, 55–57 small GTP-binding proteins, 55–57 TNF, 62–63 transcriptional control, 52–53

52–53
Cardiomyopathy
liporegulation and, 337
Cardiovascular physiology
cardiac hypertrophy and,
45–66
lipid receptors in
cardiovascular
development and, 23–38

development and, 23–38 stress-activated cytokines and the heart, 81–95 Carnitine palmitoyl transferase

liporegulation and, 335–36 Catalytic cycle Na,K-ATPase structure and mechanism, 832–38

β-Catenin second messenger pathways in pulmonary host defense and, 653

Cation channels TRP channel regulation via lipid second messengers and, 749–51

Cationic liposome/DNA complexes lung gene therapy and, 592–93, 597, 602

Cation specificity
Na,K-ATPase structure and
mechanism, 831–32

Cation transport Na,K-ATPase structure and mechanism, 817–41

functional genomics and comparative physiology of hypoxia, 217 Caveolin-1 alveolar type I epithelial cells and, 678-81

Cavities
G protein-coupled receptor
rhodopsin and, 868–69
CCO-3

hensin and terminal differentiation, 567–80

CD14 protein aminophospholipid asymmetry and, 714–15

CD93 protein aminophospholipid asymmetry and, 715

hensin and terminal differentiation, 571 mammalian urea transporters and, 543–46, 548 microarray technology and,

238–40 cds genes TRP channel regulation via lipid second messengers and, 747

CED proteins aminophospholipid asymmetry and, 711, 713

Cell biogenesis aminophospholipid asymmetry and, 706–7

Cell membrane protreins Na,K-ATPase structure and mechanism, 817–41

Cell migration lipid receptors in cardiovascular development and, 27–28

Cell physiology acid secretion by parietal cell and, 103–23 calcium channel permeation and selectivity, 133–55 processive and nonprocessive models of kinesin movement, 161–72

Cell proliferation alveolar type I epithelial cells and, 669

Cell senescence aminophospholipid asymmetry and, 709–10 Central nervous system

(CNS) hyperpolarization-activated cation currents and, 464–71

CEP ciliated sensory neurons transducing touch in Caenorhabditis elegans and, 435

Ceramide liporegulation and, 333, 338–39, 342–43 second messenger pathways in pulmonary

host defense and, 654–55
Cerebral cortex
NMR of glutamate
neurotransmitter flux and
neuroenergetics, 401–20
Cerebral metabolic rate

(CMR) of oxygen consumption NMR of glutamate neurotransmitter flux and neuroenergetics, 401–20

c-fos gene functional genomics and comparative physiology of hypoxia, 221 gastric enterochromaffin-like cells and, 373

CFTR channel lung gene therapy and, 587–89, 593–95, 598–602 CHAMP protein cardiac hypertrophy and, 63-64

Chickens

functional genomics and comparative physiology of hypoxia, 217–18

Chimeric analysis gastric biology of

Helicobacter pylori and, 349, 363

Chinese hamster ovary (CHO) cells aminophospholipid asymmetry and, 703

Chloephaga melanoptera functional genomics and comparative physiology of hypoxia, 211

Cholecystolinin (CCK) acid secretion by parietal cell and, 112

Cholesterol

history of research, 7–8 nuclear receptors in metabolism and, 261–62, 273–84

Cholesterol ester transfer protein (CETP)

nuclear receptors in metabolism and, 262, 275, 278–79

Cholesterol 7 α-hydroxylase (CYP7A1)

nuclear receptors in metabolism and, 262, 267, 279–83, 286

Cholinergic pathways acid secretion by parietal cell and, 109-11

Chromogranin A promoter gastric acid secretion in genetically engineered mice and, 394

gastric enterochromaffin-like cells and, 371, 373, 375 Chromophore-binding sites G protein-coupled receptor rhodopsin and, 851, 863–65, 868–69

Chronic acid resistance gastric biology of Helicobacter pylori and, 363–64

cis-activation

lung gene therapy and, 599

11-cis-retinal

G protein-coupled receptor rhodopsin and, 851-71

c-jun gene

functional genomics and comparative physiology of hypoxia, 221 gastric enterochromaffin-like cells and, 373

Cl-

gastric enterochromaffin-like cells and, 371, 373–74 macula densa cell signaling and, 481–95

Cl⁻:HCO⁻3 exchange hensin and terminal differentiation, 569–70

Clarithromycin gastric biology of Helicobacter pylori and, 349, 364–65

Clathrin coat proteins acid secretion by parietal cell and, 115

Cloning

microarray technology and, 238–40

Clustering

phosphoinositide regulation of actin cytoskeleton and, 761

Coactivators

nuclear receptors in metabolism and, 263

Coat proteins

phosphoinositides in membrane retrieval and insertion, 791–808

Cofactors

Na,K-ATPase structure and mechanism, 817–41 paracrine factors in tubuloglomerular response and, 501–20

Cofilin/ADF

phosphoinositide regulation of actin cytoskeleton and, 773–74

Collagen

hensin and terminal differentiation, 571, 573

Colon cancer

aminophospholipid asymmetry and, 710

Combinatorial synthesis of genetic networks

functional genomics and comparative physiology of hypoxia, 213

Comparative physiology functional genomics and

comparative physiology of hypoxia, 203–24 microarray technology and, 231–51

mitochondrial variation in vertebrate muscle and, 177–93

Compensatory response cardiac hypertrophy and, 64–66

Complement receptors aminophospholipid asymmetry and, 715

Conditional ablation insulin receptor knockout mice and, 318

Cone visual pigments G protein-coupled receptor rhodopsin and, 869 Congenital generalized lipodystrophy liporegulation and, 335–38 connexin 43 gene second messenger pathways in pulmonary

host defense and, 653 Consomic panels functional genomics and comparative physiology of hypoxia, 203, 209–10

Contractile activity
cardiac hypertrophy and,
45–66
mitochondrial variation in
vertebrate muscle and,
177–93

Coregulators nuclear receptors in metabolism and, 261

Corepressors nuclear receptors in metabolism and, 263

Cortical collecting tubule hensin and terminal differentiation, 567-80

Corticosterone hensin and terminal differentiation, 569

Cortisol liporegulation and, 343–44 Cotransporters

macula densa cell signaling and, 483–91 type IIa Na/Pi

cotransporter and, 531–36 CpG dinucleotides lung gene therapy and, 592

Cre/loxp system insulin receptor knockout mice and, 316–20, 322–23

Crosstalk

aminophospholipid asymmetry and, 701–20 phosphoinositide regulation of actin cytoskeleton and, 775, 761

crq gene aminophospholipid asymmetry and, 713

Cryo-electron microscopy G protein-coupled receptor rhodopsin and, 866–67

Crystal structure G protein-coupled receptor rhodopsin and, 851, 857–67

cup-5 gene transducing touch in Caenorhabditis elegans and, 444

Cupiennius salei transducing touch in Caenorhabditis elegans and, 433, 437

Curosurf surfactant therapy for ALI/ARDS and, 620

Cushing's syndrome liporegulation and, 333, 343

Cyclic adenosine
monophosphate (cAMP)
acid secretion by parietal
cell and, 103–23
paracrine factors in
tubuloglomerular
response and, 501–20
cyclin D1 gene

second messenger pathways in pulmonary host defense and, 653

Cysteine calcium channel permeation and selectivity, 145

Cystic fibrosis lung gene therapy and, 585–87, 593–96, 598–603 surfactant therapy for ALI/ARDS and, 632 Cytochrome 3A (CYP3A) nuclear receptors in metabolism and, 262, 266–67, 284–87

Cytokines liporegulation and, 343 second messenger pathways in pulmonary host defense and, 642–57 stress-activated cytokines and the heart, 81–95

Cytoplasmic domains Na,K-ATPase structure and mechanism, 817, 832–37

Cytoskeleton acid secretion by parietal cell and, 103–23 actin-based acid secretion by parietal

cell and, 118–22 phosphoinositide regulation and, 761–80

Cytosol macula densa cell signaling and, 481, 489–90 Cytotoxic T-lymphocytes

lung gene therapy and, 591

D

daf mutants insulin receptor knockout mice and, 324–25 dauer stage

insulin receptor knockout mice and, 324–25

dDAVP mammalian urea transporters and, 548, 550, 555 Defensins

lung gene therapy and, 597 DEG/EnaC channels transducing touch in Caenorhabditis elegans and, 429, 436–42

del-1 gene transducing touch in Caenorhabditis elegans and, 438–39, 441–42
Deletion mutants
gastric biology of
Helicobacter pylori and,
349, 360–62
phosphoinositide
regulation of actin
cytoskeleton and.

Dendritic actin nucleation phosphoinositide regulation of actin cytoskeleton and, 771

769-70

Dendritic integration hyperpolarization-activated cation currents and, 453, 465-66

Dephosphorylation Na,K-ATPase structure and mechanism, 840

Detoxification nuclear receptors in metabolism and, 284–87 Deuterostomes

stress-activated cytokines and the heart, 84–85

alveolar type I epithelial cells and, 669–88 insulin receptor knockout mice and, 313, 316–17,

Development

323 lipid receptors in cardiovascular development and, 23, 29–37

mammalian urea transporters and, 551, 554 mitochondrial variation in vertebrate muscle and, 177, 187–89

Dexamethasone mammalian urea transporters and, 547, 551–52

Diabetes aminophospholipid asymmetry and, 703, 709 insulin receptor knockout mice and, 313, 317–19, 321–25 liporegulation and, 337–39,

mammalian urea transporters and, 552 nuclear receptors in metabolism and, 261, 268, 272–73

paracrine factors in tubuloglomerular response and, 501, 518-20

Diacylglycerol liporegulation and, 342 TRP channel regulation via lipid second messengers and, 749–50

Diacylglycerol kinase TRP channel regulation via lipid second messengers and, 735–52

Dictyostelium discoideum phosphoinositides in membrane retrieval and insertion, 799

Dietary fat lipid receptors in cardiovascular development and, 23–38 liporegulation and, 333–44

Differentiation
mitochondrial variation in
vertebrate muscle and,
177, 187–89
nuclear receptors in

metabolism and, 269-70 Dihydrotachysterol mammalian urea

transporters and, 555 Dihydrotestosterone history of research, 1, 9-10, 14-16

Dilated cardiomyopathy liporegulation and, 340

Dimerization

G protein-coupled receptor rhodopsin and, 857–58 nuclear receptors in metabolism and, 262–63

Dimethyl maleic anhydride (DMMA)

hensin and terminal differentiation, 572

Dipeptidyl peptidase IV hensin and terminal differentiation, 576

Directionality processive and nonprocessive models of kinesin movement, 163

DiSC3
gastric biology of
Helicobacter pylori and,
358

Discovery science functional genomics and comparative physiology

comparative physiolog of hypoxia, 223 Disease aminophospholipid

aminophospholipid asymmetry and, 703, 709–10, 713 gastric biology of Helicobacter pylori and, 349–65 G protein-coupled receptor

rhodopsion and, 863 hyperpolarization-activated cation currents and, 471 liporegulation and, 333–44 nuclear receptors in metabolism and, 261.

Diving mammals functional genomics and comparative physiology of hypoxia, 214

DMBT1 gene hensin and terminal differentiation, 571 DNA laddering

268-87

liporegulation and, 340-41 cell and, 112 Domestic animal studies Dynamin functional genomics and comparative physiology of hypoxia, 217-19 gastric Drosophila spp. aminophospholipid cells and, 371, 376-77 asymmetry and, 713 G protein-coupled receptor E rhodopsin and, 852 microarray technology and, 232, 241-42 mitochondrial variation in EBP50 vertebrate muscle and. nuclear receptors in Ecology metabolism and, 266-67 processive and nonprocessive models of kinesin movement, 165 second messenger pathways in pulmonary host defense and, 644 transducing touch in Caenorhabditis elegans and, 430, 432, 437, Edema TRP channel regulation via lipid second messengers and, 735-52

DRS2 gene aminophospholipid asymmetry and, 705 Drug-drug interactions

type IIa Na/Pi

nuclear receptors in metabolism and, 286-87 DsMit gene

cotransporter and, 531-36

functional genomics and comparative physiology of hypoxia, 208

Dual vector approaches lung gene therapy and, 598-99

Duodenal peptides acid secretion by parietal acid secretion by parietal cell and, 116 enterochromaffin-like

E₁-E₂ transitions Na,K-ATPase structure and mechanism, 817, 835

acid secretion by parietal cell and, 121

functional genomics and comparative physiology of hypoxia, 215-16 Ecto-5'-nucleotidase*

paracrine factors in tubuloglomerular response and, 501, 513

Ectopic lipid deposition liporegulation and, 333

surfactant therapy for ALI/ARDS and, 615, 624 **EDG** receptors lipid receptors in cardiovascular

development and, 28-37 **EEEE locus** calcium channel permeation and selectivity, 133-55

Effectors acid secretion by parietal cell and, 103-23 phosphoinositides in membrane retrieval and insertion, 791-808

Electrolytes hensin and terminal differentiation, 567-80 macula densa cell signaling and, 481-95

mammalian urea transporters and, 543 paracrine factors in tubuloglomerular response and, 501-20 type IIa Na/Pi cotransporter and, 531-36 Electrophysiology

TRP channel regulation via lipid second messengers and, 737-38

Electrostatic interactions phosphoinositide regulation of actin cytoskeleton and, 764

Embryonic growth insulin receptor knockout mice and, 313 ENaC epithelial ion channel

lung gene therapy and, 593 Endobiotics

nuclear receptors in metabolism and, 261-87

Endocrinology acid secretion by parietal cell and, 103-23 insulin receptor knockout mice and, 313-25 nuclear receptors in metabolism and, 261-87

Endocytosis gastric enterochromaffin-like cells and, 371, 376-77 hensin and terminal differentiation, 567-80 phosphoinositides in membrane retrieval and insertion, 791-808 type IIa Na/Pi cotransporter and, 531-36

Endosomes lung gene therapy and, 593 phosphoinositides in membrane retrieval and insertion, 791-808 Endothelins

hensin and terminal differentiation, 578

Energy homeostasis nuclear receptors in metabolism and, 271–72

Energy metabolism insulin receptor knockout mice and, 313–25 mitochondrial variation in vertebrate muscle and, 178–83, 190–92 nuclear receptors in

metabolism and, 261
Energy transduction
Na,K-ATPase structure and
mechanism, 832–40

Enterochromaffin-like (ECL) cells Ca²⁺ channels, 373–74

Cl⁻ channels, 373–74 endocytosis, 376–77 exocytosis, 375–76

gastric acid secretion in genetically engineered mice and, 383–96 histamine storage, 374–75

K⁺ channels, 373–74 pathophysiology in chronic

gastritis, 377 physiological stimulants and inhibitors of function, 371–73

Enterohepatic circulation nuclear receptors in metabolism and, 282–84

Entorhinal cortex neurons hyperpolarization-activated cation currents and, 469

Env gene lung gene therapy and, 589, 592

Environmental factors functional genomics and comparative physiology of hypoxia, 222–23 nuclear receptors in metabolism and, 261 transducing touch in Caenorhabditis elegans and, 433–34

Environmental physiology microarray technology and, 231-51

Epidermal growth factor (EGF) acid secretion by parietal cell and, 111-12

Epithelial cells

alveolar type I epithelial cells and, 669–88 gastric acid secretion in genetically engineered mice and, 383–96 hensin and terminal differentiation, 567–80

Equines

functional genomics and comparative physiology of hypoxia, 218–19

Erythrocytes

aminophospholipid asymmetry and, 703, 706 mammalian urea transporters and, 543–58

Escherichia coli

functional genomics and comparative physiology of hypoxia, 211, 213 gastric biology of Helicobacter pylori and,

350, 354 microarray technology and,

transducing touch in Caenorhabditis elegans and, 431, 446

Estrogen excess history of research, 12–13

ETB receptor hensin and terminal differentiation, 578

Eukaryotic cells phosphoinositides in membrane retrieval and insertion, 791-808

Evolution

functional genomics and comparative physiology of hypoxia, 203–24 microarray technology and, 231–51 mitochondrial variation in vertebrate muscle and, 177–93

Excitation

TRP channel regulation via lipid second messengers and, 738–45

Exercise

insulin receptor knockout mice and, 323 mitochondrial variation in vertebrate muscle and, 177–93

Exocytosis

gastric enterochromaffin-like cells and, 371, 375–76 phosphoinositides in membrane retrieval and insertion, 800–3, 806–7 surfactant therapy for ALI/ARDS and, 616

Exosurf surfactant therapy for ALI/ARDS and, 620, 625–26

Experimental evolution functional genomics and comparative physiology of hypoxia, 213

Expression analysis microarray technology and, 238–41

Extra-renal urea transporters mammalian urea transporters and, 558

Extracellular matrix hensin and terminal differentiation, 567–80 Ezrin acid secretion by parietal cell and, 120–22 Ezrin/radixin/moesin (ERM) proteins phosphoinositide regulation of actin cytoskeleton and, 777

F

Farnesyl X receptor (FXR) nuclear receptors in metabolism and, 261–62, 266, 278–79 FAS protein

liporegulation and, 336
Fat tolerance

liporegulation and, 333–44
Fatty acid-binding protein

(FABP) nuclear receptors in metabolism and, 269

Fatty acids insulin receptor knockout mice and, 320

liporegulation and, 337–38, 340, 342

nuclear receptors in metabolism and, 261, 271 Fatty acid synthase

liporegulation and, 335
Fertility impairment
insulin receptor knockout
mice and, 319–20, 323

Fetal development alveolar type I epithelial cells and, 684–85

Fibrinogen hensin and terminal differentiation, 579 surfactant therapy for ALI/ARDS and, 618

Fibronectin hensin and terminal differentiation, 571, 579

Filamin phosphoinositide regulation of actin cytoskeleton and, 776–77 FIRKO mice insulin receptor knockout mice and, 320–21

Fish functional genomics and comparative physiology

of hypoxia, 210, 214 Flopases aminophospholipid asymmetry and, 705

FLP ciliated sensory neurons transducing touch in Caenorhabditis elegans and, 434–35

Flux
calcium channel
permeation and
selectivity, 133–55
NMR of glutamate
neurotransmitter flux and
neuroenergetics, 401–20

Force sensitivity transducing touch in Caenorhabditis elegans and, 429, 433–36

Forestomach gastric acid secretion in genetically engineered mice and, 395

Foxo mutations insulin receptor knockout mice and, 325

fra-1 gene second messenger pathways in pulmonary host defense and, 653

Free fatty acids liporegulation and, 338 nuclear receptors in metabolism and, 271

Fuel homeostasis insulin receptor knockout mice and, 313–25

Fugu rubripes transducing touch in Caenorhabditis elegans and, 441, 443–44
Functional activation
NMR of glutamate
neurotransmitter flux and
neuroenergetics, 410–11
Functional assymetry

Functional assymetry calcium channel permeation and selectivity, 141–44

Functional genomics comparative physiology of hypoxia and, 203–24

Functional magnetic resonance imaging (fMRI)

NMR of glutamate neurotransmitter flux and neuroenergetics, 401–20

Fundulus heteroclitus microarray technology and, 239

Furosemide mammalian urea transporters and, 551, 556 FYVE domain

phosphoinositides in membrane retrieval and insertion, 791–95, 797, 807

G

Gag gene lung gene therapy and, 589, 592

β-Galactosidase liporegulation and, 341 Galectin

hensin and terminal differentiation, 572–73, 578

Gallbladder disease nuclear receptors in metabolism and, 261, 268

Gallus domesticus functional genomics and comparative physiology of hypoxia, 217–18 Gas exchange alveolar type I epithelial cells and, 669 Gastric acid

acid secretion by parietal cell and, 103–23 acid secretion in genetically engineered mice and, 383–96

Gastric carcinoma aminophospholipid asymmetry and, 710 gastric biology of Helicobacter pylori and, 349, 351, 365 gastric enterochromaffin-like cells and, 371

Gastric mucosal pathway gastric acid secretion in genetically engineered mice and, 390–91

Gastrin

acid secretion by parietal cell and, 103–23 gastric acid secretion in genetically engineered mice and, 383–96

gastric biology of Helicobacter pylori and, 351

gastric enterochromaffin-like cells and, 371–77

Gastritis

chronic gastric enterochromaffin-like cells and, 377

Gastrointestinal physiology gastric acid secretion in genetically engineered mice and, 383–86 gastric biology of Helicobacter pylori and, 349–65 gastric

enterochromaffin-like cells and, 371–77 nuclear receptors in metabolism and, 280–84 surfactant therapy for ALI/ARDS and, 613–14

G cells gastric acid secretion in genetically engineered mice and, 394–95

lung gene therapy and, 596 phosphoinositide regulation of actin cytoskeleton and, 774–75

Gene therapy for inherited lung diseases airway gene therapy targets for cystic

> fibrosis, 593–96 airway stem cell tagets for gene therapy, 595–96

α 1-antitrypsin deficiency, 587 barriers to gene transfer in lung, 596–98 cationic liposome/DNA complexes, 592–93, 602

CFTR, 594, 595 clinical trials, 601–3 cystic fibrosis, 586–603 dual vector approaches capable of expanding rAAV packaging capacity, 598–99 future research, 603–4 immunologic barriers to gene delivery in lung, 596–97

intracellular barriers to viral transduction, 597–98 introduction, 585–86

introduction, 585–86 new technologies, 598–601 phenotype, 594, 595 physical barriers to gene delivery in lung, 596–97 polarity of airway

epithelial gene transfer, 597–98

recombinant adeno-associated virus, 590-603

recombinant adenovirus, 588-90

recombinant lentiviruses, 592

recombinant retroviruses, 592

self-complementing rAAV vectors, 599-600

spliceosome-mediated trans-splicing, 600 targets, 586–87 vectors, 588–93

Genetic ablation studies insulin receptor knockout mice and, 313–25

Genetic deletion hyperpolarization-activated cation currents and, 471–72

Genetic engineering gastric acid secretion in genetically engineered mice and, 383–96

Genetic networks combinatorial synthesis of functional genomics and comparative physiology of hypoxia,

Genetic screens transducing touch in Caenorhabditis elegans and, 429-46

213

Gene transcripts microarray technology and, 231–51 Genomics

functional genomics and comparative physiology of hypoxia, 203-24 microarray technology and, 231-51

Gillichthys mirabilis

functional genomics and comparative physiology of hypoxia, 210 microarray technology and, 242, 246, 248

GL-67 cationic lipid formulation lung gene therapy and, 593

Glial cells

NMR of glutamate neurotransmitter flux and neuroenergetics, 401-20

Glomerular filtration macula densa cell signaling and, 481-95

Glucagon

liporegulation and, 335

Glucocorticoids liporegulation and, 343 mammalian urea transporters and, 543, 547, 551-52

Glucocortoids mammalian urea transporters and, 552

Glucokinase

insulin receptor knockout mice and, 317, 322 liporegulation and, 340-41

Glucose

insulin receptor knockout mice and, 313 liporegulation and, 335,

337, 341 NMR of glutamate neurotransmitter flux and neuroenergetics, 401-20

nuclear receptors in metabolism and, 261, 269-73

non-oxidative

glycolysis, 411 oxidative glycolysis, 411 resting neuronal activity, 418

summary, 419-20

416-17

GLUT2 glucose transporter insulin receptor knockout

mice and, 317 liporegulation and,

340-41 nuclear receptors in

metabolism and, 272

GLUT4 glucose transporter insulin receptor knockout mice and, 319-21

nuclear receptors in metabolism and, 272

Glutamate

calcium channel permeation and selectivity, 133-55

Glutamate-glutamine cycle NMR of neurotransmitter flux and neuroenergetics cerebral cortex, 406-8 cerebral metabolic rate, 413-16

conclusions, 419-20 fMRI, 414-18 functional activation, 410-11 glial activity, 403-6

glucose oxidation, 408 - 12

glycogen shunt, 413 introduction, 402-3 in vivo 13C MRS,

403-11

lactate efflux, 413 lactate generation,

411-12 neuronal activity,

403-17

total neuroenergetics,

Glycerol

insulin receptor knockout mice and, 320

Glycogen shunt

NMR of glutamate neurotransmitter flux and neuroenergetics, 413

Glycolysis

NMR of glutamate neurotransmitter flux and neuroenergetics, 411

 β 2-Glycoprotein I (β 2GPI) receptor

aminophospholipid asymmetry and, 715-16

Gobidae

functional genomics and comparative physiology of hypoxia, 214

gp130 receptor cardiac hypertrophy and, 59-60

GPAT protein

liporegulation and, 336 GPI-linked proteins

hensin and terminal

differentiation, 576 G protein-coupled receptor rhodopsin (GPCR)

> activation mechanism cavities, 868-69 chromophore-binding

site, 868-69 unified model, 867-68 conclusions, 870-71

cone visual pigments, 869 crystal structure

bacteriorhodopsin, 866-67

chromophore-binding site, 863-65 cryo-electron

microscopy, 866-67 crystallization, 857

crystallographic lattice, 857-58

data analysis, 857 dimers, 857-58

cardiac hypertrophy and, functional regions, cells and, 371, 377 865-66 Growth retardation helices, 860-63 insulin receptor knockout Heart cardiac hypertrophy and, mice and, 313, 316-17, human diseases associated with 323 hyperpolarization-activated mutation in rhodopsin GSK-38 kinase cardiac hypertrophy and, cation currents and, 453, gene, 863 interhelical reactions. 49-51 462-71 GW-501516 liporegulation and, 335, 860-63 337-38, 340 previous models, 866 nuclear receptors in structural constraints. metabolism and, 264 mammalian urea 865-66 transporters and, 543, three-dimensional H 557-58 H+ model, 858-59 stress-activated cytokines two-dimensional model. gastric biology of and, 81-95 859-60 Helicobacter pylori and, Heat map historical perspective, 354 microarray technology and, hensin and terminal 237 851-53 differentiation, 567-80 Helices introduction, 851-53 other G protein-coupled H.K-ATPase G protein-coupled receptor receptors, 869-70 acid secretion by parietal rhodopsin and, 860-63 rhodopsin cell and, 112-18 Na.K-ATPase structure and Na.K-ATPase structure and mechanism, 817-41 composition, 854-55 expression, 853 mechanism, 817-41 Helicobacter pylori mutagenesis, 856 H(Na)-K ATPase gastric biology of photobleaching pathway, macula densa cell signaling acid resistance 855-56 and, 481-95 mechanisms, 353-64 purification, 853-54 Hand-over-hand model acute acid resistance, regeneration, 855-56 processive and 354-63 G proteins nonprocessive models of chronic acid resistance. cardiac hypertrophy and, kinesin movement, 161, 363-64 168-70 eradication, 364-65 55-57 lipid receptors in Hantavirus habitat, 351-52 cardiovascular functional genomics and intrabacterial disease. development and, 23-38 comparative physiology 354-59 paracrine factors in of hypoxia, 216 introduction, 350-51 tubuloglomerular Haploinsufficiency nature of organism, response and, 501-20 insulin receptor knockout 352-53 phosphoinositide mice and, 313, 323-25 proton motive force. regulation of actin HCl secretion 354-59 cytoskeleton and, 767-68 time-independent acid acid secretion by parietal Gram-negative bacteria cell and, 103-23 resistance, 354 gastric biology of HCN channels urease, 364 Helicobacter pylori and, hyperpolarization-activated urea transport, 359-62 349 cation currents and, UreI, 362-63 gastric 453-72 gastric enterochromaffin-like **HDAC** proteins enterochromaffin-like

cells and, 371, 377

Helisoma trivolvis

transducing touch in

Caenorhabditis elegans
and, 441

Helix aspersa transducing touch in Caenorhabditis elegans and, 441

Helix packing stability Na,K-ATPase structure and mechanism, 825–28

Hemodynamics

renal

macula densa cell signaling and, 481–95

Hemoglobin surfactant therapy for ALI/ARDS and, 618

Hensin terminal differentiation of intercalated cells and,

567–80 Heparan sulfate proteoglycan lung gene therapy and, 591

Hepatic nuclear factor 4α (HNF4- α)

nuclear receptors in metabolism and, 262

Heteromeric protein complexes

type IIa Na/Pi cotransporter and, 531-36

High-affinity Ca²⁺ binding region calcium channel

permeation and selectivity, 139–41

High-density lipoprotein (HDL)

nuclear receptors in metabolism and, 262, 273–80

High-density seeding in vivo hensin and terminal

differentiation, 578–79

High-frequency oscillation (HFO) surfactant therapy for

surfactant therapy for ALI/ARDS and, 631

Histamine

acid secretion by parietal cell and, 103-23 gastric acid secretion in

genetically engineered mice and, 383–96

gastric

enterochromaffin-like cells and, 371-77

Histidine decarboxylase (HDC)

gastric

enterochromaffin-like cells and, 371-75

HL-10 surfactant surfactant therapy for ALI/ARDS and, 620

HNP proteins

lung gene therapy and, 597

Homeostasis aminophospholipid asymmetry and, 701, 711 gastric acid secretion in genetically engineered mice and, 383–96

insulin receptor knockout mice and, 313–25 liporegulation and, 333–44 nuclear receptors in

metabolism and, 270–73 phosphoinositide regulation of actin cytoskeleton and, 764–65

Homology models Na,K-ATPase structure and mechanism, 817–41

Hormones

gastric enterochromaffin-like cells and, 371 history of research, 1–17

Host defense pulmonary

second messenger pathways in, 642 "Hula Twist" mechanism G protein-coupled receptor rhodopsin and, 855

11β-Hydroxysteroiddehydrogenase-1 (11β-HSD-1)

liporegulation and, 343 Hyperfiltration

paracrine factors in

tubuloglomerular response and, 501, 519

Hypergastrinemia gastric acid secretion in genetically engineered mice and, 383-96

Hyperlipidemia nuclear receptors in metabolism and, 261, 268

Hyperphagia

liporegulation and, 338 Hyperpolarization-activated cation currents (I_h) basic properties, 454–56

brain, 461–62 cardiac automaticity, 466–68

central nervous system, 464–71

cerebellar Purkinje cells, 469

conclusions, 472 dendritic integration, 465–66

disease, 471

entorhinal cortex neurons, 469

general principles, 456–59 genetic deletion experiments, 471–72

HCN channel function, 459–61

heart, 462-71

historical perspective,

introduction, 453-54 neuronal automaticity, 468-69 physiological role, 456-71 primary pacemaking. 468-69 resting potential, 464-65 safety net for automaticity, 469 sensory signal transduction, 464-65 spontaneous firing, 469 subthreshold oscillations. 469 subunit assembly, 463-64 synaptic transmission. 470-71 thalamocortical relay neurons, 468-69 Hypertrophic signaling cardiac hypertrophy and, 45-66 Hypochlorhydria gastric enterochromaffin-like cells and, 371 Hypoglycemia insulin receptor knockout mice and, 315, 317-18 Hypoxia functional genomics and comparative physiology air-breathing fishes, 214 birds, 210-11 cattle, 217 chickens, 217-18 combinatorial synthesis of genetic networks. 213 comparative molecular physiology, 216-17 conclusions, 223-24 consomic panels, 209-10 discovery science vs

hypothesis testing, 223

diving mammals, 214 domestic animal studies. 217-19 environmental forces in natural selection. 222-23 equines, 218-19 evolutionary mechanisms, 220-21 experimental evolution, 213 fish, 210, 214 future studies, 220-23 gene expression, 205-6, 221 human studies, 219 inbred strains of mice. 207-8 introduction, 203-5 linkage analysis, 208 model organisms, 205-10 phylogeneticallyindependent contrasts. 214 phylogenetics, 220 physiological ecology, 215 - 16physiological profiling, 211-12 rats, 208-10 segregation analysis, 207 - 8selective breeding. 207-9, 212-13 systems biology, 213 transgenic mice, 206-7 types of hypoxia, 221-22

I Igf receptors insulin receptor knockout mice and, 313–25 IL1 neurons transducing touch in Caenorhabditis elegans

and, 435

Ileal bile acid-binding protein
(I-BABP)
nuclear receptors in
metabolism and, 262

Ileal bile acid transporter
(I-BAT)
nuclear receptors in
metabolism and, 262,
266

Immune response
alveolar type I epithelial

cells and, 682–83
aminophospholipid
asymmetry and, 701–20
lung gene therapy and,
596–97
surfactant therapy for
ALI/ARDS and, 615
InaD gene

InaD gene
TRP channel regulation via
lipid second messengers
and, 746

Inchworm model
processive and
nonprocessive models of
kinesin movement, 161,
168–70

Inducible nitric oxide synthase (iNOS) liporegulation and, 341–42 Infasurf

surfactant therapy for ALI/ARDS and, 619–20, 625

Infection second messenger pathways in pulmonary host defense and, 642–57

Inflammatory response alveolar type I epithelial cells and, 642–57 second messenger pathways in pulmonary host defense and, 642 Inner medullary collecting

Inner medullary collecting duct

mammalian urea transporters and, 543. 545-46, 548-51, 555-56

Inner membrane leaflet aminophospholipid asymmetry and, 701-20 Inositol

TRP channel regulation via lipid second messengers and, 735-52

Inositol triphosphate (PIP3) insulin receptor knockout mice and, 320, 322, 324-25

Input conductance hyperpolarization-activated cation currents and, 453-72

Insect phagocyte receptors aminophospholipid asymmetry and, 713-18

Inside-out signaling hensin and terminal differentiation, 579

InsP₃

TRP channel regulation via lipid second messengers and, 739-41

INSR gene insulin receptor knockout mice and, 315-18

Insulin receptor knockout mice adipose tissue, 320-22

brown adipocytes, 322 conclusions, 325 conditional ablation, 318 diabetes, 323-25 differences between humans and mice lacking INSR. 315-18 generalized ablation of insulin receptors, 314-23 growth effects, 316

haploinsufficiency, 323-25 introduction, 313-14

metabolic effects, 317-18

nestin-positive neurons, 322 - 23pancreatic \(\beta\)-cells, 321-22 skeletal muscle, 318-20

Insulin resistance

insulin receptor knockout mice and, 321, 324 liporegulation and, 337 nuclear receptors in metabolism and, 261. 268, 271-72

Integrins

aminophospholipid asymmetry and, 712, 714 Intercalated cells terminal differentiation and, 567-80

Intercellular adhesion molecule-1 (ICAM-1) alveolar type I epithelial cells and, 682-83

Interhelical reactions G protein-coupled receptor rhodopsin and, 860-63

Interleukin 1 (IL-1) stress-activated cytokines and the heart, 81-95 Interleukin 6 (IL-6)

lung gene therapy and, 602 Intrabacterial disease

gastric biology of Helicobacter pylori and, 354-59

Ion channels hyperpolarization-activated cation currents and. 453-72

macula densa cell signaling and, 481-95 transducing touch in Caenorhabditis elegans

and, 429-46 Ion selectivity calcium channel permeation and selectivity, 133-55 Ion transport

alveolar type I epithelial cells and, 669, 683-84 calcium channel permeation and selectivity, 146-47

Ionomycin acid secretion by parietal cell and, 121

IRAK protein second messenger pathways in pulmonary host defense and, 646, 656

BIRKO mice insulin receptor knockout mice and, 322

Isoelectric point gastric biology of Helicobacter pylori and, 349, 354, 363

ITR promoter lung gene therapy and, 598-99

J

Juxtaglomerular apparatus macula densa cell signaling and, 491-93 paracrine factors in tubuloglomerular response and, 501-20

323-25

K+

calcium channel permeation and selectivity, 133-55 gastric enterochromaffin-like cells and, 371, 373-74 macula densa cell signaling and, 481-95 Na.K-ATPase structure and mechanism, 817-41 Ketoacidosis insulin receptor knockout mice and, 313, 319.

Kidneys hensin and terminal differentiation, 567-80 514-15 liporegulation and, 338 macula densa cell signaling L and, 481-95 L-165041 mammalian urea transporters and, 543-58 paracrine factors in Lactate NMR of glutamate tubuloglomerular response and, 501-20 type IIa Na/Pi cotransporter and, 531-36 LacZ reporter gene Kinesin movement processive and Laminin nonprocessive models of conclusions, 172 directionality, 163 LAMP proteins introduction, 161 nonprocessive mechanisms, 170-72 Large aggregates processive mechanisms. 163-65, 167-70 properties of kinesin Lattice motility, 163-65 crystallographic structure of kinsein. 165-67

Kinetics

mechanism, 819 TRP channel regulation via lipid second messengers and, 735, 745-47

Na.K-ATPase structure and

Kir gene

TRP channel regulation via lipid second messengers and, 744

KL-4 surfactant surfactant therapy for ALI/ARDS and, 619, 625 Knockouts

gastric acid secretion in genetically engineered mice and, 383-96

insulin receptor knockout mice and, 313 paracrine factors in

tubuloglomerular response and, 501, 505-6,

nuclear receptors in metabolism and, 264

neurotransmitter flux and neuroenergetics, 411-13

lung gene therapy and, 599

hensin and terminal differentiation, 571

aminophospholipid asymmetry and, 717

surfactant therapy for ALI/ARDS and, 616-19

G protein-coupled receptor rhodopsin and, 857-58

Leakiness

membrane mitochondrial variation in vertebrate muscle and. 179-81

Lecithin: cholesterol acyltransferase (LCAT) nuclear receptors in metabolism and, 262

Lectins

alveolar type I epithelial cells and, 671, 683, 687

Left ventricular remodeling stress-activated cytokines and the heart, 93-94

Length constants

hyperpolarization-activated cation currents and. 453-72

Lentiviruses recombinant lung gene therapy and,

Leptin

insulin receptor knockout mice and, 321 liporegulation and, 333 nuclear receptors in metabolism and, 269, 271

Leukemia aminophospholipid asymmetry and, 710

Ligands aminophospholipid asymmetry and, 701, 711-18 nuclear receptors in metabolism and, 261,

Light-sensitive chromophore G protein-coupled receptor rhodopsin and, 851-71

Limulus spp.

263-68

TRP channel regulation via lipid second messengers and, 739

Linkage analysis functional genomics and

comparative physiology of hypoxia, 208 Lipid bilayer phosphoinositide

regulation of actin cytoskeleton and, 761, 779-80

Lipid receptors aminophospholipid asymmetry and, 701-20 cardiovascular development and angiogenesis, 26-29

cell migration, 27-28 EDG receptors, 28-37 embryonic development. 29-37

future research, 37-38

introduction, 23-26 pathways in pulmonary Liver X receptor (LXR) lpa1, 35-36 host defense and, 642-57 nuclear receptors in mouse, 31-37 Lipoprotein lipase metabolism and, 261-62, platelet-derived growth nuclear receptors in 265-66, 268, 273, factor, 34-35 metabolism and, 262, 276-77, 279 slp1, 32-35 269, 274-76 Localization s1p2, 29-32 Liporegulation phosphoinositides in s1p3, 36-37 fat tolerance, 335-41 membrane retrieval and signaling, 27-28 introduction, 333-34 insertion, 798-800, 804-5 summary, 37-38 leptin, 334-41 Long-term regulation vascular maturation. leptin deficiency, 335-41 mammalian urea 28-29 lipoapoptosis, 340, 342-44 transporters and, 549-52, zebrafish, 29-31 lipotoxicity, 340, 342-44 554-55 phosphoinositide post-receptor lepton Loss-of-function mutants regulation of actin resistance in diet-induced gastric acid secretion in cytoskeleton and, 761-80 obesity, 343 genetically engineered phosphoinositides in mice and, 387-88 Liposomes membrane retrieval and lung gene therapy and, lov-1 mutant insertion, 791-808 592-93, 597 transducing touch in TRP channel regulation via Lipotoxicity Caenorhabditis elegans lipid second messengers liporegulation and, 333, and, 443-44 and, 735-52 340, 342-44 Low-density lipoprotein Lipids LIRKO mice (LDL) cardiac hypertrophy and, insulin receptor knockout nuclear receptors in 60-62 mice and, 321 metabolism and, 262 decade of, 697-99 Lithium LOX-1 receptor gastric biology of mammalian urea aminophospholipid transporters and, 551, 557 Helicobacter pylori and, asymmetry and, 712, 717 353, 359 Lithocholic acid lpa 1 gene insulin receptor knockout nuclear receptors in lipid receptors in mice and, 313-25 metabolism and, 262 cardiovascular nuclear receptors in Liver development and, 35-36, metabolism and, 261, insulin receptor knockout 268, 280-84 mice and, 318-19, 321, L-type calcium channels 325 second messenger gastric pathways in pulmonary liporegulation and, 335, enterochromaffin-like host defense and, 642-57 337-38, 340 cells and, 371, 373-74 surfactant therapy for mammalian urea Lucilia spp. TRP channel regulation via ALI/ARDS and, 615, 616, transporters and, 543, 618, 620, 625, 628, 632 556-58 lipid second messengers and, 739 Lipopenia nuclear receptors in liporegulation and, 343 metabolism and, 282-84 Lungs Lipopolysaccharide (LPS) Liver receptor homolog-1 alveolar type I epithelial gastric biology of (LRH-1) cells and, 669-88 Helicobacter pylori and, nuclear receptors in gene therapy for inherited

metabolism and, 261-62,

267-68

diseases of, 585-604

second messenger

353

second messenger

pathways in pulmonary host defense and, 642-57 surfactant therapy for ALI/ARDS and, 613-32

LXR genes

nuclear receptors in metabolism and, 265-66

Lycopersicon esculentum alveolar type I epithelial cells and, 683

Lymnaea stagnalis transducing touch in Caenorhabditis elegans and, 441

Lysophosphatidic acid lipid receptors in cardiovascular development and, 23-38

Lysophospholipids lipid receptors in cardiovascular development and, 23-38

M

Maclura pomifera alveolar type I epithelial cells and, 671

α2-Macroglobulin receptor aminophospholipid asymmetry and, 712

Macrophages alveolar type I epithelial cells and, 669

aminophospholipid asymmetry and, 703, 711 - 13

second messenger pathways in pulmonary host defense and, 642-57

Macrosialin aminophospholipid asymmetry and, 712

Macula densa cells paracrine factors in tubuloglomerular response and, 501, 510 signaling and

adenosine, 493-95 apical K conductance, 485-86 ATP, 493-95 cytosolic calcium regulation, 489-90

introduction, 481-83 iuxtaglomerular apparatus, 491–93

membrane potential. 483-91

multi-photon imaging, 491-93

Na/H exchangers, 486-88 Na:K:Cl cotransport,

483-91 signaling, 493-95 sodium regulation,

488-89 transport, 490-91

¹³C Magnetic resonance spectroscopy (13C MRS) glutamate neurotransmitter flux and neuroenergetics, 401-20

Maladaptation cardiac hypertrophy and, 64-66

stress-activated cytokines and the heart, 81, 88-94

Malonev murine leukemia virus (MLV) lung gene therapy and, 592

Malonyl CoA liporegulation and, 335 Mammals

urea transporters and, 543-58

Manduca spp. transducing touch in Caenorhabditis elegans and, 437

Mast cells aminophospholipid asymmetry and, 703 Master regulators nuclear receptors in metabolism and, 261 Matrix metalloproteinases

(MMPs) cardiac hypertrophy and, 62-63

Maxi-anion channel macula densa cell signaling and, 481-95

MDR proteins aminophospholipid asymmetry and, 705-6

mec genes transducing touch in Caenorhabditis elegans and, 429, 434-35.

438-40, 442 Mechanosensation transducing touch in Caenorhabditis elegans and, 429-46

MEF2 protein cardiac hypertrophy and, 52-53

Megakaryocytes aminophospholipid asymmetry and, 703

Melanoma aminophospholipid asymmetry and, 703, 710

Membrane biogenesis mitochondrial variation in vertebrate muscle and. 184-85

Membrane domains Na.K-ATPase structure and mechanism, 838-40

Membrane fission phosphoinositides in membrane retrieval and insertion, 791-808

Membrane fusion acid secretion by parietal cell and, 103-23

Membrane insertion/retrieval phosphoinositides in

membrane retrieval and mice and, 313-25 insertion, 791-808 liporegulation and, 341, Membrane leakiness 343 mitochondrial variation in mitochondrial variation in vertebrate muscle and. vertebrate muscle and. 178-83, 190-92 179-81 Membrane lipid assymetry TRP channel regulation via apoptosis and, 701-20 lipid second messengers Membrane potential and, 748 macula densa cell signaling Methylation and, 483-91 alveolar type I epithelial Membrane protein structure cells and, 673 Na.K-ATPase structure and N-Methyl-D-glucamine mechanism, 817-41 mammalian urea Membrane protrusions transporters and, 555-56 phosphoinositides in Metronidazole membrane retrieval and gastric biology of insertion, 798-800 Helicobacter pylori and, Membrane recruitment 349, 364 Mg2+ acid secretion by parietal cell and, 103-23 Membrane transport type IIa Na/Pi cotransporter and, 531-36 Mer receptor aminophospholipid asymmetry and, 712-73 Metabolic receptors nuclear receptors in metabolism and, 261 Metabolic stress TRP channel regulation via lipid second messengers and, 745 Metabolic syndrome liporegulation and, 333, nuclear receptors in metabolism and, 269

Metabolism

60-62

alveolar type I epithelial

cardiac hypertrophy and,

insulin receptor knockout

cholesterol and, 7-8

cells and, 669

Na,K-ATPase structure and mechanism, 817-41 Mg2+-ATPase aminophospholipid asymmetry and, 704-5 MgE₁-P[3Na] complex Na.K-ATPase structure and mechanism, 837 Microarray technology applications in environmental and comparative physiology biological regulation, 232 - 34cDNA clone sets as core requirement for expression analysis of nonmodel species, 238-41 environmental stress responses in nonmodel organisms, 246-47 evolutionary analysis, 243-44 expression analysis, 238-41 genetic analysis, 243-44 genomes, 249-50 introduction, 231-32 model organisms and their responses to the natural environment. 244-46 new arrayed paradigm, 234-38 perspectives, 250-51 sources of variability in expression profiles, 240-41 species, 247-49 taxa, 247-49 transcriptome, 232-49 utility of microarray approaches, 242-43

Microtubules processive and nonprocessive models of kinesin movement, 161 - 72Microvilli

hensin and terminal differentiation, 567-80 TRP channel regulation via lipid second messengers and, 745-46 mil mutant

cardiovascular development and, 29-32 MIRKO mice insulin receptor knockout mice and, 318-19 Mitochondrial variation in vertebrate muscle

lipid receptors in

adaptive remodeling, 187-89 development, 187-89 differentiation, 187-89 energy metabolism, 178 - 83evolutionary variation, 181-83, 192-93 gene expression, 189-90

introduction, 177-78 membrane biogenesis, 184-85 membrane leakiness. mitochondrial capacity. 187-93 organelle structure, 183-87 oxidative phosphorylation, phenotypic variation. 181-83 reactive oxygen species, 179-81 regulation, 183-93 reticulum, 186-87 thermogenesis, 179-81 ultrastructural analysis, 183-84 Mitogen-activated protein kinases (MAPKs) cardiac hypertrophy and, 57-58 second messenger pathways in pulmonary Musca spp. host defense and, 642-57 Mitoxantrone-resistance protein (MRP) Muscle

aminophospholipid asymmetry and, 705 Moesin phosphoinositide regulation of actin cytoskeleton and, 777 Molecular motors processive and nonprocessive models of kinesin movement. 161-72 Molecular phenotype alveolar type I epithelial cells and, 669

monoamine oxidase A gene functional genomics and comparative physiology

of hypoxia, 206 Motor domains processive and nonprocessive models of kinesin movement. 161 - 72

Mucosal hypertrophy gastric acid secretion in genetically engineered mice and, 390-91

Multi-ion pore calcium channel permeation and selectivity, 136-37

Multi-photon imaging macula densa cell signaling and, 481, 491-93

Multidrug resistance proteins aminophospholipid asymmetry and, 705-6

Mus musculus functional genomics and comparative physiology of hypoxia, 207 microarray technology and, 232

TRP channel regulation via lipid second messengers and, 739

hyperpolarization-activated cation currents and, 453-72 insulin receptor knockout

mice and, 318-20 liporegulation and, 335, 338 mitochondrial variation

and, 177-93 nuclear receptors in metabolism and, 270-73

Mutagenesis gastric acid secretion in genetically engineered mice and, 383-96 gastric biology of

Helicobacter pylori and, 349, 360-62 G protein-coupled receptor rhodopsin and, 856-63 Na.K-ATPase structure and mechanism, 817-41 Mycobacterium spp.

microarray technology and, 250 MvD88 protein

second messenger pathways in pulmonary host defense and, 646, 656

Myocardium aminophospholipid asymmetry and, 703 cardiac hypertrophy and, 45-66 stress-activated cytokines and the heart, 81-95 Myosin Vb acid secretion by parietal

cell and, 116-17

Na+ calcium channel permeation and selectivity, 133-55 macula densa cell signaling and, 488-89 Na.K-ATPase structure and mechanism, 817-41

NaCl macula densa cell signaling and, 481-95 paracrine factors in tubuloglomerular response and, 501. 516-17

Na/H exchangers cardiac hypertrophy and, macula densa cell signaling and, 486-88 Na,K-ATPase α-subunit, 825-26

 $\alpha \gamma - \beta \gamma$ subunit interactions, 827, 829 A domain, 824, 832-38 ATP binding, 835-36 ATP-binding site, 821-22 ATP driven K+ uptake, 838-39 Ca-ATPase, 820-25 catalytic cycle, 832-35 cation specificity, 831-32 conclusions, 841 cytoplasmic domain. 832-37 cytoplasmic domains, 838-40 E₁-E₂ conformations, 835 E₁-E₂ transitions, 820-40 energy transduction. 832-40 helix packing stability, 825-28 introduction, 817-19 K+-activated dephosphorylation, 840 K⁺ binding sites, 828, 830-32 kinetic mechanism, 819 membrane domains. 838-40 Mg²⁺ binding, 837 MgATP, 835-36 MgE₁-P[3Na] complex, 837 Na+ binding sites, 828, 830-32 Na+-dependent phosphorylation, 840 Na⁺ movements, 839-40 N domain, 820-38 P domain, 823-24, 832-40 perspectives, 841 phosphorylation, 840 structure, 820-25 transmembrane region, 824-25, 828, 830-32 macula densa cell signaling

and, 481, 483-91 Na/Pi cotransporter type IIa (NaPi-IIa) regulation in proximal tubule conclusions, 536 overview, 531-32 PDZ/NaPi-IIa network, 534-36 protein interactions. 534-36 regulatory mechanisms. 532-33 Natural selection functional genomics and comparative physiology of hypoxia, 222-23 N cytoplasmic domains Na.K-ATPase structure and mechanism, 817, 820-21, 832-38 Nestin-positive neurons insulin receptor knockout mice and, 322-23 Neural pathways acid secretion by parietal cell and, 103-23 Neuronal automaticity hyperpolarization-activated cation currents and. 468-69 Neurons aminophospholipid asymmetry and, 703, 706-7

706–7
hyperpolarization-activated cation currents and, 453–72
insulin receptor knockout mice and, 322, 323
NMR of glutamate neurotransmitter flux and neuroenergetics, 401–20 paracrine factors in tubuloglomerular response and, 501–20 transducing touch in

Caenorhabditis elegans and, 434-35, 440, 442, 445 Neuropeptide Y (NPY) insulin receptor knockout mice and, 323 Neurophysiology hyperpolarization-activated cation currents and, 453-72 NMR of glutamate neurotransmitter flux and neuroenergetics, 401-20 transducing touch in Caenorhabditis elegans and, 429-46 Neurotransmitters gastric enterochromaffin-like cells and, 371-77 NMR of glutamate neurotransmitter flux and neuroenergetics, 401-20 New arrayed paradigm microarray technology and, 234-38 NF-KB

NF-κB second messenger pathways in pulmonary host defense and, 642–57 NFAT proteins cardiac hypertrophy and, 46–49

Ni²⁺ gastric biology of Helicobacter pylori and, 349, 355, 364

NIDDM1 mutant insulin receptor knockout mice and, 324 ninaE gene

TRP channel regulation via lipid second messengers and, 739

Nitric oxide (NO) paracrine factors in tubuloglomerular

response and, 501. 514-20 Nitric oxide synthase (NOS) paracrine factors in tubuloglomerular response and, 501, 514-15 nompC mutant transducing touch in Caenorhabditis elegans and, 442-43 Non-oxidative glycolysis NMR of glutamate neurotransmitter flux and neuroenergetics, 411 Nonprocessive motors kinesin movement and, 161 - 72Non-selectivity filter domains calcium channel permeation and selectivity, 146 norpA gene TRP channel regulation via lipid second messengers and, 739, 741-42, 745-46 NOS-1 knockout mice paracrine factors in tubuloglomerular response and, 514-15 NOS-3 gene functional genomics and comparative physiology of hypoxia, 206 NR0B2 nuclear receptors in metabolism and, 268 NR5A2 nuclear receptors in metabolism and, 267 NRF transcription factor mitochondrial variation in vertebrate muscle and. 177, 189

NRH genes

nuclear receptors in

metabolism and, 265, 266

¹³C Nuclear magnetic resonance (13C NMR) glutamate neurotransmitter flux and neuroenergetics, 401-20 Nuclear receptors in control of metabolism ABCA1, 275-77 adipocytes, 269-73 apo-AI, 275 apo-AII, 275 bile acids, 280-86 cholesterol, 280-84 coactivators, 263 conclusions, 287-88 corepressors, 263 detoxification, 284-87 differentiation of adipocytes, 269-70 dimerization, 262-63 drug-drug interactions, 286-87 endobiotics, 284-87 energy homeostasis, 271-72 enterohepatic circulation, 282-84 fat, 270-73 FXR. 266 general concepts, 262 glucose homeostasis, 270 - 73glucose sensitivity, 269-73 HDL, 273-80 intestinal lipid metabolism, 280-84 ligands, 263-68 LRH-1, 267 LXR α and β , 265–66 metabolic sensors in health and disease. 268-87 muscle, 270-73 NR0B2, 268 NR1H2, 265-66 NR1H3, 265-66

NR1H4, 266 NR1I2, 266-67 NR5A2, 267 pancreas, 270-73 parallel reverse cholesterol transport pathway, 279-80 PPARα. 264-75 PPAR B/8, 264 PPARy, 264-73 PPARs, 263-75 PXR, 266-67 PXR/SXR, 284-87 reverse cholesterol transport, 273-80 SHP. 268 structure, 262-63 tissue distribution. 263 - 68triglycerides, 273-80 xenobiotics, 284-87 5'-Nucleotidase paracrine factors in tubuloglomerular response and, 501-20

O Obesity

insulin receptor knockout mice and, 319, 323 liporegulation and, 333–44 nuclear receptors in metabolism and, 261, 268, 271

OLQ neurons transducing touch in Caenorhabditis elegans and, 435

Onchorhynchus mykiss functional genomics and comparative physiology of hypoxia, 217

"One-bond-flip" mechanism G protein-coupled receptor rhodopsin and, 855

Opsin
G protein-coupled receptor

rhodopsin and, 851–71 ORCC epithelial ion channel lung gene therapy and, 593

Orexin

insulin receptor knockout mice and, 323

Organic anion transporting polypeptide (OATP) nuclear receptors in metabolism and, 262, 282, 285–86

Organogenesis lipid receptors in cardiovascular development and, 23–38

osm-9 mutant transducing touch in Caenorhabditis elegans

and, 429, 443–44

Ouabain

mammalian urea

transporters and, 555–56

Outer membrane leaflet aminophospholipid asymmetry and, 701–20

Ovarian cancer aminophospholipid asymmetry and, 710

Oxidative cleavage Na,K-ATPase structure and mechanism, 817–41

Oxidative glycolysis NMR of glutamate neurotransmitter flux and neuroenergetics, 401–20

Oxidative phosphorylation mitochondrial variation in vertebrate muscle and, 177-83

Oxygen

functional genomics and comparative physiology of hypoxia, 203–24 NMR of glutamate neurotransmitter flux and neuroenergetics, 401–20 F

P1 purinergic agonists paracrine factors in tubuloglomerular response and, 501-7

Pacemaker hyperpolarization-activated cation currents and, 453–72

Packaging capacity lung gene therapy and, 598–99

Pancreatic β-cells insulin receptor knockout mice and, 313–25 liporegulation and, 338, 340–43 nuclear receptors in metabolism and, 270–73

Paracrine factors tubuloglomerular response and, 501-20

Paracrine pathways acid secretion by parietal cell and, 103-23

Parietal cells
gastric acid secretion in
genetically engineered
mice and, 383–96
gastric biology of
Helicobacter pylori and,
365

P cytoplasmic domains Na,K-ATPase structure and mechanism, 817–41

PC-12 cells aminophospholipid asymmetry and, 703

PDE ciliated sensory neurons transducing touch in Caenorhabditis elegans and, 435

PDZ domains

PDZ proteins

TRP channel regulation via lipid second messengers and, 745–46 type IIa Na/Pi cotransporter and, 531, 534–36

Pendrin

hensin and terminal differentiation, 569

Pepck gene insulin receptor knockout mice and, 317 Peptic ulcer disease

gastric biology of

Helicobacter pylori and,
349, 351–52

Perilipin nuclear receptors in metabolism and, 269

Periplasm
bacterial
gastric biology of
Helicobacter pylori
and, 349

Permeation calcium channel permeation and selectivity, 133–55

Peromyscus maniculatus functional genomics and comparative physiology of hypoxia, 215–16 mitochondrial variation in vertebrate muscle and, 189

Peroxisome

proliferator-activated receptors (PPARs) liporegulation and, 335–36 mitochondrial variation in vertebrate muscle and, 189

nuclear receptors in metabolism and, 261-75

PGC-1 protein liporegulation and, 335 mitochondrial variation in vertebrate muscle and, 177, 189, 193

pH gastric acid secretion in

genetically engineered mice and, 383-96 gastric biology of Helicobacter pylori and, 349-65 Phagocytosis aminophospholipid asymmetry and, 701, 711 - 13PH domain phosphoinositides in membrane retrieval and insertion, 791-95. 797-99, 804, 807 Phenotype alveolar type I epithelial cells and, 669-88 insulin receptor knockout mice and, 323 lung gene therapy and, 594, mitochondrial variation in vertebrate muscle and. 177, 181-83 Phloretin mammalian urea transporters and, 546, 549, 554-57 Phosphate inorganic type IIa Na/Pi cotransporter and, 531-36 Phosphatidylethanolamine aminophospholipid asymmetry and, 701-20 Phosphatidyl inositol 4,5 biphosphate (PIP₂) phosphoinositide

regulation of actin

cytoskeleton and.

phosphoinositides in

insertion, 791-808

membrane retrieval and

TRP channel regulation via

lipid second messengers

761-80

Phosphatidylinositol 4,5 triphosphate (PIP3) phosphoinositides in membrane retrieval and insertion, 791-808 Phosphatidylserine aminophospholipid asymmetry and, 701-20 Phosphoenol pyruvate carboxykinase (PEPCK) nuclear receptors in metabolism and, 269 Phosphoinositide 3-kinases (PI3Ks) cardiac hypertrophy and, 49-51 nuclear receptors in metabolism and, 272 second messenger pathways in pulmonary host defense and, 653-54 Phosphoinositides (PPIs) actin cytoskeleton regulation by α-actinin, 775-76 actin nucleation, 771. 773-75 activation, 767-68 Arf family GTPases, 768 Arp2/3, 771-73 capping, 774-75 cofilin/ADF, 773-74 deletion of PIP5KI genes, 770 deletion of PPI 5-phosphatase genes, 769-70 dendritic actin nucleation, 771 experimental manipulation, 768-70 explosive proliferation of known PPI-binding proteins and PPI-binding modules, 762-64

and, 735-52

ezrin/radixin/moesin, 777 filamin, 776-77 gelsolin, 774-75 genetics, 769-70 historical overview. 761-62 mechanisms for PPI regulation of actin-binding proteins. 778-79 overexpression, 769 PIP2, 766-75 PIP₃, 766 PIP5KI, 767-70 plasma membrane, 767-68 PPI 5-phosphatase, 769-70 PPI-binding motifs in cytoskeletal proteins, 763-64 PPI transients at site of dynamic actin polymerization, 764-68 protein binding effects on lipid bilayer and PPI binding on protein structures, 779-80 recruitment, 767-68 Rho family GTPases. 767 severing, 773-75 spatial and temporal regulation of PPI at sites of actin assembly, 765-67 specificity of electrostatic interactions, 764 structural conservation. 762-63 synergistic activation, 772 talin, 777-78 vinculin, 777-78

WASP family proteins, 771-73 in membrane retrieval and insertion asymmetric cellular localization, 792-97 asymmetric localization of PtdIns(4.5)P2 in plasma membrane, 804-5 conclusions, 807-8 detection of PPIs in intact cells, 793-95 dynamics of PtdIns(3,4,5)P2 turnover and function at plasma membrane. 803-7 dynamics of PtdIns(3,4,5)P3 turnover and function at plasma membrane, 798-803 exocytosis and PtdIns(4,5)P2 function, 806-7

PtdIns(4,5)P2 function, 806–7 exocytosis at sites of concentrated PtdIns(3,4,5)P3, 800–2 introduction, 791–92 localization of PtdIns(3,4,5) in membrane protrusions, 798–800

membrane recycling pathway, 795–97 potential mechanisms of PtdIns(3,4,5)P3mediated exocytosis, 802–3 PtdIns(4,5)P2 turnover

PtdIns(4,5)P2 turnover and scission step in membrane retrieval, 805-6

TRP channel regulation via lipid second messengers and, 747–48 Phospholipase C TRP channel regulation via lipid second messengers and, 735–52

Phospholipids aminophospholipid asymmetry and, 701–20 gastric biology of *Helicobacter pylori* and, 353, 359 insulin receptor knockout

mice and, 320, 322, 324–25 lipid receptors in cardiovascular development and, 23–38 surfactant therapy for ALI/ARDS and, 616, 618,

620, 625, 628, 632 Phospholipid transfer protein (PLTP) nuclear receptors in

metabolism and, 262, 278
Phosphorylation

hosphorylation
acid secretion by parietal
cell and, 106–9
hensin and terminal
differentiation, 579
insulin receptor knockout
mice and, 315
liporegulation and, 335,
341, 343
mammalian urea
transporters and, 543,
548–49
mitochondrial variation in
vertebrate muscle and,
177–83
Na.K-ATPase structure and

mechanism, 840 second messenger pathways in pulmonary host defense and, 654 Photobleaching pathway

Photobleaching pathway G protein-coupled receptor rhodopsin and, 855–56 Photoreceptors TRP channel regulation via lipid second messengers and, 737-45

Phototransduction

G protein-coupled receptor rhodopsin and, 851–71 TRP channel regulation via lipid second messengers and, 735–52

Phylogeny

functional genomics and comparative physiology of hypoxia, 203–24 microarray technology and, 231–51

Physiological ecology functional genomics and comparative physiology of hypoxia, 215–16

Physiological profiling functional genomics and comparative physiology of hypoxia, 211–12

Ping-pong transport mechanism Na,K-ATPase structure ar

Na,K-ATPase structure and mechanism, 819

Pituitary adenylyl cyclase-activating peptide (PACAP)

gastric enterochromaffin-like cells and, 371-74

pkd-2 gene

transducing touch in Caenorhabditis elegans and, 444

Plants

processive and nonprocessive models of kinesin movement, 161–72

Plasma membrane acid secretion by parietal cell and, 103–23 aminophospholipid asymmetry and, 701–20 gastric
enterochromaffin-like
cells and, 371
phosphoinositide
regulation of actin
cytoskeleton and, 761–80
phosphoinositides in
membrane retrieval and
insertion, 791–808
Plasticity

differentiation, 576–77 Platelet-derived growth factor (PDGF)

hensin and terminal

lipid receptors in cardiovascular development and, 34–35

Platelets aminophospholipid asymmetry and, 703

Pneumonia surfactant therapy for ALI/ARDS and, 613–14, 630

Pol gene lung gene therapy and, 589, 592

Polarity hensin and terminal differentiation, 567–80 lung gene therapy and,

Polyclonal antibodies mammalian urea transporters and, 543 Polymerization

597-98

hensin and terminal differentiation, 567–80 phosphoinositide regulation of actin cytoskeleton and, 761, 764–75

Polyunsaturated fatty acids (PUFAs) TRP channel regulation v

TRP channel regulation via lipid second messengers and, 735, 741, 750 Pores multi-ion calcium channel permeation and

selectivity, 136–37 Positive-end expiratory pressure (PEEP) surfactant therapy for ALI/ARDS and, 628,

630-31

Positron emission tomography (PET) NMR of glutamate neurotransmitter flux and neuroenergetics,

401–20 PPAR transcription factor mitochondrial variation in vertebrate muscle and, 177–93

ppk gene transducing touch in Caenorhabditis elegans and, 437

Predicted structures calcium channel permeation and selectivity, 152–54

Pregnane X receptor/steroid and xenobiotic receptor (PXR/SXR)

nuclear receptors in metabolism and, 261–62, 266–67, 284–87

Pre-therapeutic mRNA (PTM) lung gene therapy and, 600-1

Primary pacemaking hyperpolarization-activated cation currents and, 468–69

Procambarus alleni
transducing touch in
Caenorhabditis elegans
and, 433
Processive motors

kinesin movement and, 161–72

Promoter specificity alveolar type I epithelial cells and, 673-74

Prostatic hyperplasia history of research, 1, 14–16

Protein kinase A (PKA) acid secretion by parietal cell and, 106–9

Protein kinase C (PKC) cardiac hypertrophy and, 58–59 insulin receptor knockout mice and, 320

Protein kinases type IIa Na/Pi cotransporter and, 531-36

Protein sorting phosphoinositides in membrane retrieval and insertion, 791–808

Proteolytic cleavage Na,K-ATPase structure and mechanism, 817–41

Proton motive force gastric biology of Helicobacter pylori and, 349, 354-59

Proton pump acid secretion by parietal cell and, 103–23

Proton pump inhibitors (PPIs) gastric biology of *Helicobacter pylori* and, 349, 364–65

Protostomes stress-activated cytokines and the heart, 84–85

Protozoa processive and nonprocessive models of kinesin movement, 161–72

Proximal tubule

type IIa Na/Pi cotransporter and, 531-36

PS receptor (PSr) aminophospholipid asymmetry and, 712, 718

Pseudohermaphroditism male

history of research, 1 Pseudomonas aeruginosa lung gene therapy and, 587

PSOX receptor aminophospholipid asymmetry and, 712, 717-18

P-type cation pumps Na.K-ATPase structure and mechanism, 817-41

Pulmonary disorders lung gene therapy and, 585-604

Pulmonary host defense second messenger pathways and, 642

Pulmonary injury surfactant therapy for ALI/ARDS and. 613-32

Purinergic receptors paracrine factors in tubuloglomerular response and, 501-7

Purkinje cells cerebellar

hyperpolarizationactivated cation currents and, 469

PX domain phosphoinositides in membrane retrieval and insertion, 791-98, 807

QLQ ciliated sensory neurons transducing touch in Caenorhabditis elegans and, 434-35

R

Rab proteins acid secretion by parietal cell and, 114-15

Radixin

phosphoinositide regulation of actin cytoskeleton and, 777

Raft lipid microdomains phosphoinositide regulation of actin cytoskeleton and, 761

Rapid regulation mammalian urea transporters and, 548-49

Rate theory calcium channel permeation and selectivity, 148-51

rdg genes TRP channel regulation via lipid second messengers and, 742-44, 747-48

Reabsorption mammalian urea transporters and, 555-56 type IIa Na/Pi cotransporter and, 531-36

Reactive oxygen species mitochondrial variation in vertebrate muscle and. 177, 179-81

Receptor redundancy aminophospholipid asymmetry and, 718-19

Receptor tyrosine kinases hensin and terminal differentiation, 579 insulin receptor knockout mice and, 322

Recombinant human deoxyribonuclease (rhDNase)

lung gene therapy and, 596-97 Recycling

acid secretion by parietal

cell and, 103-23 phosphoinositides in membrane retrieval and insertion, 791, 795-97 TRP channel regulation via lipid second messengers and, 747-48

Red blood cells (RBCs) aminophospholipid asymmetry and, 703, 706, 709-10 mammalian urea transporters and, 543-58

Regeneration G protein-coupled receptor rhodopsin and,

Regulation alveolar type I epithelial cells and, 672-77, 679-80 gastric acid secretion in genetically engineered

mice and, 383-96 macula densa cell signaling and, 481-95 mammalian urea transporters and, 543,

548-52, 554-55 microarray technology and, 232-34

mitochondrial variation in vertebrate muscle and. 183-93

nuclear receptors in metabolism and, 261 paracrine factors in tubuloglomerular response and, 501-20 phosphoinositide regulation of actin cytoskeleton and, 761-80 TRP channel regulation via lipid second messengers and, 735-52

type IIa Na/Pi cotransporter and, 531-36

Remodeling adaptive

mitochondrial variation in vertebrate muscle and, 177, 187–89

Renal ablation paracrine factors in tubuloglomerular response and, 520

Renal failure mammalian urea transporters and, 552

Renal physiology hensin and terminal differentiation, 567–80 macula densa cell signaling and, 481–95

transporters and, 543–58 paracrine factors in tubuloglomerular response and, 501–20 type IIa Na/Pi cotransporter and,

mammalian urea

531–36 Renin-angiotensin mammalian urea

transporters and, 552 Reproductive abnormalities insulin receptor knockout mice and, 313, 316–17

Resistin nuclear receptors in metabolism and, 271

Respiratory genes mitochondrial variation in vertebrate muscle and, 177–93

Response elements nuclear receptors in metabolism and, 262

Resting potentials hyperpolarization-activated cation currents and, 453, 464-65

Reticulum mitochondrial variation in vertebrate muscle and, 177, 186–87

Retinal photoreceptor protein G protein-coupled receptor rhodopsin and, 851-71

Retinitis pigmentosa G protein-coupled receptor rhodopsin and, 863

Retinoid X receptor (RXR) nuclear receptors in metabolism and, 262–66, 270, 276–78

Retroviruses recombinant lung gene therapy and, 592

Reverse cholesterol transport nuclear receptors in metabolism and, 262–80

Rhodopsin G protein-coupled receptor rhodopsin and, 851-71

Rho family GTPases phosphoinositide regulation of actin cytoskeleton and, 767

Ricinus communis alveolar type I epithelial cells and, 671, 683

RMD motor neurons transducing touch in Caenorhabditis elegans and, 435

RNA-directed reprogramming lung gene therapy and, 593

rpk gene transducing touch in Caenorhabditis elegans and, 437

Ruffles hensin and terminal differentiation, 567–80

S
slp genes
lipid receptors in

cardiovascular development and, 29-38

Saccharomyces cerevisiae microarray technology and, 232, 238, 242, 244–45 phosphoinositides in membrane retrieval and insertion, 806

Salmonella typhimurium gastric biology of Helicobacter pylori and, 350

phosphoinositides in membrane retrieval and insertion, 806

Sarcomeric signaling cardiac hypertrophy and, 55–57

Sarcoplasmic reticulum Na,K-ATPase structure and mechanism, 817–41

Scaffolding phosphoinositide regulation of actin cytoskeleton and, 761–80

Scavenger receptor superfamily aminophospholipid asymmetry and, 712, 716–18 paracrine factors in tubuloglomerular

Schiff base protonated G protein-coupled receptor rhodopsin and,

response and, 517-18

851–71
Scission
phosphoinositides in
membrane retrieval and

insertion, 805-6 Scott syndrome aminophospholipid asymmetry and, 706

Scramblase aminophospholipid

asymmetry and, 706 Seabright Bantam syndrome history of research, 5, 12–13 Second messengers

pathways in pulmonary host defense and conclusions, 657 introduction, 642–43 LPS, 645–47 macrophages, 643–44 MAP kinases, 650–53 PI 3-kinase pathway, 653–54 espsis, 655–57 sphingolipids, 654–55 TNFα, 647 transcription factors, 647–50

phosphoinositide regulation of actin cytoskeleton and, 761–80 TRP channel regulation via lipid second messengers and, 735–52

Segregation analysis functional genomics and comparative physiology of hypoxia, 207–8

Selective breeding functional genomics and comparative physiology of hypoxia, 207–9, 212–13

Selectivity calcium channel permeation and selectivity, 133–55

Self-complementing vectors lung gene therapy and, 599–600

Sensilla
male-specific
transducing touch in
Caenorhabditis elegans
and, 435–36

Sensory mechanotransduction

channels transducing touch in Caenorhabditis elegans and, 429–46

Sensory stimulation NMR of glutamate neurotransmitter flux and neuroenergetics, 416–17

Sepsis second messenger pathways in pulmonary host defense and, 642–57 surfactant therapy for ALI/ARDS and, 613–14, 624

Sequence conservation processive and nonprocessive models of kinesin movement, 161-72

Serine palmitoyl transferase liporegulation and, 341–43

Serine/threonine kinases insulin receptor knockout mice and, 315

Severing
phosphoinositide
regulation of actin
cytoskeleton and, 773–75
Sexual differentiation

history of research, 1 Sickle cells aminophospholipid

asymmetry and, 703, 709
Signal transduction
acid secretion by parietal
cell and, 103–23
alveolar type I epithelial

cells and, 669, 678–81 cardiac hypertrophy and, 45–66

G protein-coupled receptor rhodopsin and, 851–71 hensin and terminal differentiation, 577–78 hyperpolarization-activated

cation currents and, 464–65 insulin receptor knockout mice and, 313–25 lipid receptors in cardiovascular development and, 27–28 liporegulation and, 340–41, 343

lung gene therapy and, 597–98 macula densa cell signaling and, 493–95 mitochondrial variation in

mitochondrial variation in vertebrate muscle and, 177–93 nuclear receptors in

metabolism and, 261 paracrine factors in tubuloglomerular response and, 501–20 phosphoinositide regulation of actin cytoskeleton and, 761–80 phosphoinositides in membrane retrieval and insertion, 791–808 second messenger

pathways in pulmonary host defense and, 642–57 TRP channel regulation via lipid second messengers and, 735–52

Sinoatrial node cells hyperpolarization-activated cation currents and, 458

Site-directed mutagenesis gastric biology of Helicobacter pylori and, 349

Skeletal muscle insulin receptor knockout mice and, 318–20 liporegulation and, 335, 338

Slc14a2 gene mammalian urea transporters and, 546–48, 553

Small aggregates surfactant therapy for ALI/ARDS and, 616–18

Small heterodimer partner (SHP)

nuclear receptors in metabolism and, 262, 268, 278–79

SNAP-25 protein gastric enterochromaffin-like cells and, 371, 376

SNARE proteins acid secretion by parietal cell and, 103–23 gastric

enterochromaffin-like cells and, 371, 376 hensin and terminal

differentiation, 576 SOCS-3 protein liporegulation and, 343

Sodium taurocholate cotransporting polypeptide (NTCP)

nuclear receptors in metabolism and, 262, 282

Somatostatin acid secretion by parietal cell and, 112

gastric acid secretion in genetically engineered mice and, 391

Sp1 elements gastric

enterochromaffin-like cells and, 371, 375

Spatial regulation phosphoinositide regulation of actin cytoskeleton and, 765–67 Specificity

alveolar type I epithelial cells and, 673, 674 Na,K-ATPase structure and mechanism, 831, 832 phosphoinositide regulation of actin cytoskeleton and, 764

Sphingolipids second messenger pathways in pulmonary host defense and, 654–55

Sphingosine 1-phosphate lipid receptors in cardiovascular development and, 23–38

Spliceosome-mediated trans-splicing (SMaRT) lung gene therapy and, 600-1

Spontaneous firing hyperpolarization-activated cation currents and, 469

SP proteins surfactant therapy for ALI/ARDS and, 616–20, 623, 625

SRA receptors aminophospholipid asymmetry and, 712, 716

SRB receptors aminophospholipid asymmetry and, 712, 716–17

SRCL receptor aminophospholipid asymmetry and, 712, 717

SREC receptor aminophospholipid asymmetry and, 712, 717

Staphylococcus aureus acid secretion by parietal cell and, 107

STAT-3 protein cardiac hypertrophy and, 59–60

liporegulation and, 343
Stauridiosarsia producta

transducing touch in
Caenorhabditis elegans

and, 433

Steatosis

liporegulation and, 333–44 Stem cell targets

lung gene therapy and,

Steroid 5α-reductase 2 deficiency history of research, 1, 11–12

Steroid and xenobiotic receptor (SXR) nuclear receptors in metabolism and, 261–62, 284–87

Sterol 12α hydroxylase (CYP8B1) nuclear receptors in

metabolism and, 262, 279–83

Sterol 27-hydroxylase (CYP27) nuclear receptors in metabolism and, 262, 279

Sterol regulatory element binding protein (SREBP)

liporegulation and, 335–36 nuclear receptors in metabolism and, 262, 266

Stoichiometric coupling NMR of glutamate neurotransmitter flux and neuroenergetics, 401–20

Stomach
gastric acid secretion in
genetically engineered
mice and, 383–96
gastric biology of
Helicobacter pylori and,
349

gastric enterochromaffin-like cells and, 371-77

Streptococcus salivarius gastric biology of

lung gene therapy and, 591

Temporal regulation

Helicobacter pylori and, hyperpolarization-activated vertebrate muscle and. 349, 362-63 177-93 cation currents and. paracrine factors in 470-71 Streptozotocin mammalian urea tubuloglomerular Synaptobrevin transporters and, 552 response and, 501-20 gastric nuclear receptors in Surfactant therapy enterochromaffin-like metabolism and, 265 for acute lung injury/acute cells and, 371, 376 Stress respiratory distress Synaptotagmin microarray technology and, syndrome gastric Iterations of surfactant in enterochromaffin-like 231-51 Stress-activated cytokines ALI/ARDS, 617-19 cells and, 376 heart and clinical trials, 619-24 Syndrome X adaptive effects, 83-88 delivery methods, nuclear receptors in conclusions, 94-95 627-29 metabolism and, 269 introduction, 81-82 distribution, 627-29 Synechocystis spp. left ventricular dosing, 627-29 microarray technology and, remodeling, 93-94 exogenous surfactant maladaptive effects, preparations, 625-32 Synergistic activation 88-94 future research, 631-32 phosphoinositide myocardial function. introduction, 613-14 regulation of actin 89-93 nature of underlying cytoskeleton and, 772 overview, 82-83 injury, 623-24 Syntaxin Stretch receptors pathophysiology of gastric transducing touch in ALI/ARDS, 614-15 enterochromaffin-like Caenorhabditis elegans potential factors cells and, 376 and, 436 affecting outcome in hensin and terminal Structural conservation treatment trials, 622-24 differentiation, 576 phosphoinositide pulmonary surfactant Systemic lupus regulation of actin system, 615-19 erythematosus (SLE) cytoskeleton and, 762-63 summary, 631-32 aminophospholipid Substituted-cysteine surfactant in asymmetry and, 713 accessibility combination with other Systems biology calcium channel therapies, 632 functional genomics and permeation and timing of surfactant comparative physiology administration, 629-30 selectivity, 145 of hypoxia, 203-24 ventilation after Subthreshold oscillations hyperpolarization-activated surfactant cation currents and, 469 administration, 630-31 T1α molecular marker Subunit assembly Surfaxin alveolar type I epithelial hyperpolarization-activated surfactant therapy for cells and, 671-75 cation currents and. ALI/ARDS and, 619-20, Talin 463-64 625 phosphoinositide Sulfhydryl reagents Survanta regulation of actin hensin and terminal surfactant therapy for cytoskeleton and, 777-78 differentiation, 572 ALI/ARDS and, 620, T cells

625-26

Synaptic transmission

Superoxides

mitochondrial variation in

phosphoinositide regulation of actin cytoskeleton and. 765-67 Terminal differentiation of intercalated cells acid-base balance, 573 apical Cl-:HCO-3 exchange, 569-70 cell culture model of polarity reversal, 570 cell types, 567-79 collecting tubule, 567 conclusions, 579-80 cortical collecting tubule, 568-79 equivalent of high-density seeding in vivo. 578-79 extracellular matrix. 572-73 hensin, 570-73 origins, 567-79 overview, 574-76 plasticity of polarity, 576-77 signal transduction. 577-78

Testis

mammalian urea transporters and, 558

Testosterone

history of research, 1, 9-10, 14-16

Thalamocortical relay neurons hyperpolarization-activated

cation currents and, 458, 468–69

Thalassemia

aminophospholipid asymmetry and, 703, 709

Thermogenesis mitochondrial variation in vertebrate muscle and, 177, 179–81

Thiazolidinediones

nuclear receptors in metabolism and, 272

Thionicotinamide mammalian urea transporters and, 557

Thiourea

mammalian urea transporters and, 549

Thrifty gene hypothesis liporegulation and, 334

Thrombospondin aminophospholipid asymmetry and, 717 Time-independent resistance

gastric biology of

Helicobacter pylori and,
354

TIRAP protein second messenger pathways in pulmonary host defense and, 646

Toll-like receptors second messenger pathways in pulmonary host defense and, 644–46

Touch sensation transducing touch in Caenorhabditis elegans and, 429-46

Toxicologic receptors nuclear receptors in metabolism and, 261

Trafficking acid secretion by parietal cell and, 112–18 aminophospholipid asymmetry and, 702, 704 phosphoinositides in membrane retrieval and insertion, 791–808

TRAF protein second messenger pathways in pulmonary host defense and, 646

Transcriptional control cardiac hypertrophy and, 52–53

gastric
enterochromaffin-like
cells and, 371
microarray technology and,
231–51
nuclear receptors in
metabolism and, 261
second messenger
pathways in pulmonary
host defense and,
642–57

Transcription factors liporegulation and, 336 mitochondrial variation in vertebrate muscle and, 177–93 nuclear receptors in metabolism and, 261 second messenger pathways in pulmonary host defense and, 647–50

Transcriptome microarray technology and, 232–49

232–49
Transcytosis

alveolar type I epithelial cells and, 678–81 Transducing touch

in Caenorhabditis elegans
ADE, 435
amiloride-sensitive
channels, 437–42
ASC complexes, 436–37
ASH, 434
CEP, 435
Drosophila bristles,
442–43
force sensitivity, 433–36

force sensitivity, 433–36 future research, 444, 446 introduction, 429–30 male-specific sensilla, 435–36 mechanical coupling

mechanical coupling modes, 431–33 miscellaneous cells, 435 natural environment, 433–34

nompC, 442-43 PDE, 435 polymodal TRP, 443 sexy TRP, 443 stretch receptors, 436 summary, 444, 446 touch cells, 434 TRP channels, 442-44 Transforming growth factor α (TGFa) acid secretion by parietal cell and, 111-12 Transgenes functional genomics and comparative physiology of hypoxia, 203, 206-7 gastric acid secretion in genetically engineered mice and, 383-96 Transient receptor potential (TRP) channels regulation of via lipid second messengers amplification, 745-47 bump generation model, 746-47 Ca2+ stores, 739-41 conclusions, 751-52 DAG-activated channels, 749-50 DAG kinase mutants. 741-42 Drosophila phototransduction. 737-38 electrophysiology, 737 - 38excitation mechanism in Drosophila photoreceptors, 738-45 InsP₃, 739-41 introduction, 735-37 kinetics, 745-47 lipid messenger of excitation, 741-45 mammalian

lipid-regulated cation

channels, 749-51 metabolic stress, 745 metabolism, 748 microvilli, 745-46 PDZ domains, 745-46 phosphoinositide turnover, 747-48 photoreceptor ultrastructure, 737 PIP2, 743-44, 747-48. 750-51 PUFA-activated channels, 750 **Transients** phosphoinositide regulation of actin cytoskeleton and, 764-68 Transition metal-catalyzed oxidative cleavage Na.K-ATPase structure and mechanism, 817-41 Translation second messenger pathways in pulmonary host defense and, 642-57 Translocases aminophospholipid asymmetry and, 704-5 Transmembrane proteins rhodopsin and, 851-71 mechanism, 817-41 Transport

G protein-coupled receptor and, 481-95 Na,K-ATPase structure and paracrine factors and 505-6 aminophospholipid adenosine, 502-7, asymmetry and, 704-6 510-14 calcium channel permeation and adenosine receptor selectivity, 146-47 blockers, 504-5 gastric biology of adenosine receptors, Helicobacter pylori and, 503-4 359-62 afferent arterioles, macula densa cell signaling 502-4 and, 481, 490-91 angiotensin II, 506-7 Na.K-ATPase structure and ATP, 508-14 mechanism, 817-41 cAMP, 513-14 nuclear receptors in

metabolism and, 261-62. 272-80 trans-splicing spliceosome-mediated lung gene therapy and, 600 - 1Triacylglycerol liporegulation and, 336, 338-40, 342 Triglycerides nuclear receptors in metabolism and, 261. 272-80 TRP channels

> Caenorhabditis elegans and, 429, 442-44 trp gene transducing touch in Caenorhabditis elegans and, 430

transducing touch in

TRP channel regulation via lipid second messengers and, 736, 742, 748

trpl gene TRP channel regulation via lipid second messengers and, 736

Tubuloglomerular response macula densa cell signaling

A1AR knockout mice. adenosine clamp, 505-6

autoregulation, 509-10

II diabetes mellitus. UT-A1, 551 518-20 UCP-1 protein UT-B, 553-55 ecto-5'-nucleotidase. insulin receptor knockout vasopressin, 548-50 mice and, 322 volume expansion, 552 513 extracellular adenosine. Ultrastructural analysis Urease mitochondrial variation in gastric biology of 510-14 vertebrate muscle and. introduction, 501-2 Helicobacter pylori and, 183-84 349-50, 353-57, 359, knockouts, 514-15 luminal NaCl, 516-17 unc mutants 363-64 macula densa cells. transducing touch in ure genes 510-11 Caenorhabditis elegans gastric biology of nitric oxide, 514-20 and, 438-42 Helicobacter pylori and, NOS inhibitor studies, Unified model 355, 357, 359-65 UreI protein G protein-coupled receptor 514-15 NOS-1 knockout mice. rhodopsin and, 867-68 gastric biology of 514-15 Urea channel Helicobacter pylori and, 349-50, 362-63 NP scavenging, 517-18 gastric biology of renal ablation, 520 Helicobacter pylori and, Urine-concentrating ability vasoconstriction, 508-9 349, 353, 357-63 mammalian urea Tumor necrosis factor (TNF) Urea transporters transporters and, 543. cardiac hypertrophy and, mammalian 545, 548, 551, 554, 556 62-63 active urea transport, Urogenital tract stress-activated cytokines 555-56 male and the heart, 81-95 brain, 558 history of research, 1, Tumor necrosis factor-α development, 551, 554 12 - 17(TNfa) diabetes mellitus, 552 **UT-A proteins** nuclear receptors in extra-renal urea mammalian urea metabolism and, 262, transporters, 558 transporters and, 543-53, 269, 271 glucocorticoids, 551-52 556-58 second messenger heart, 557-58 UT-B protein pathways in pulmonary introduction, 543-58 mammalian urea host defense and. kidney, 544-56 transporters and, 642-57 lithium, 551 543-55 Tumors liver, 556-57 aminophospholipid long-term regulation, 549-52, 554-55 asymmetry and, 703, Vascular responses 710-11 rapid regulation, 548-49 aminophospholipid hensin and terminal renal failure, 552 asymmetry and, 703, differentiation, 567-80 Slc14a2, 546-48 710-11 Tyrosine kinases testis, 558 lipid receptors in hensin and terminal urea reabsorption, cardiovascular differentiation, 578-79 555-56 development and, 28-29 insulin receptor knockout urea secretion, 555 macula densa cell signaling mice and, 322 urine-concentrating and, 481-95 Tyrosine phosphatases ability, 544-45, 548, paracrine factors in insulin receptor knockout 551, 554, 556 tubuloglomerular mice and, 315 UT-A, 545-52, 556-58 response and, 501-20

Vasoactive intestinal peptide (VIP) acid secretion by parietal cell and, 112

Vasoconstriction paracrine factors in tubuloglomerular response and, 501–20

Vasopressin

hensin and terminal differentiation, 575 mammalian urea transporters and, 543, 546, 548–50, 554–56

Venticute surfactant therapy for ALI/ARDS and, 620–21, 623, 625, 628

Ventilation

surfactant therapy for ALI/ARDS and, 630–31 Vertebrate muscle

vertebrate muscle mitochondrial variation in, 177–93

Very-low-density lipoprotein (VLDL) liporegulation and, 340 nuclear receptors in

nuclear receptors in metabolism and, 262, 274–76

Vesicular monoamine transporters subtype 2 (VMAT2) gastric

enterochromaffin-like cells and, 371, 373–75 Vibrio cholerae

gastric biology of Helicobacter pylori and, 350

Vinculin phosphoinositide

regulation of actin cytoskeleton and, 777-78 Viruses

functional genomics and comparative physiology of hypoxia, 216 lung gene therapy and, 585, 588-604 surfactant therapy for ALI/ARDS and, 615

Vision

G protein-coupled receptor rhodopsin and, 851–71 Vitamin A

G protein-coupled receptor rhodopsin and, 851–71

Vitronectin aminophospholipid asymmetry and, 712, 717

Voltage gating calcium channel permeation and selectivity, 133–55 gastric biology of Helicobacter pylori and,

Vomeroglandin hensin and terminal differentiation, 571

W

Wall tension cardiac hypertrophy and, 45–66

WASP family proteins phosphoinositide regulation of actin cytoskeleton and, 771–73

Water channel alveolar type I epithelial cells and, 669, 675–78 white gene

nuclear receptors in metabolism and, 277

Whole-genome microarrays

microarray technology and, 231–51 Wilson JD, 1–17 Wound repair aminophospholipid

asymmetry and, 707-8

X

Xenobiotics nuclear receptors in metabolism and, 261, 284-87

Xenopus laevis
gastric biology of
Helicobacter pylori and,
349, 360, 363
hensin and terminal
differentiation, 569
mammalian urea
transporters and, 545,
553
transducing touch in
Caenorhabditis elegans
and, 439, 442, 444

X-ray crystallography
G protein-coupled receptor rhodopsin and, 851, 857-67

Y

Yeast
microarray technology and,
232, 238, 242, 244–45
phosphoinositides in
membrane retrieval and
insertion, 806
Yersinia enterocolitica

gastric biology of Helicobacter pylori and, 350

Z

ZDF fa/fa rats liporegulation and, 335–41



